McGraw-Hill DIGEST

NOVEMBER 1949

BUSINESS · ENGINEERING · INDUSTRY

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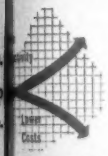

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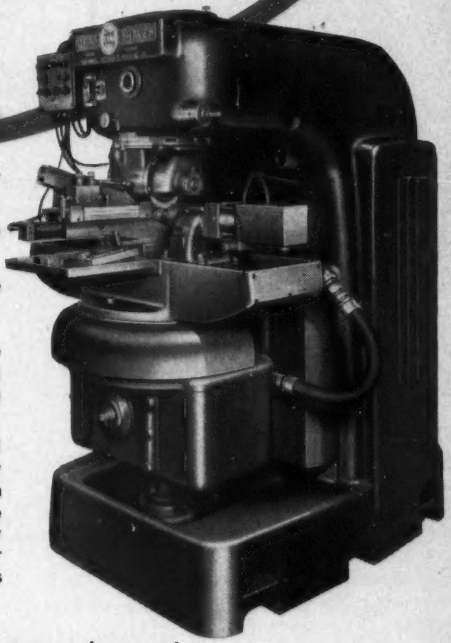

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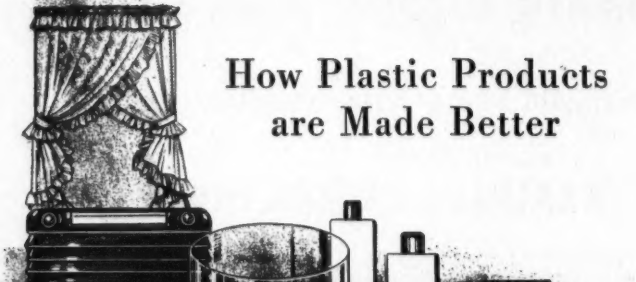

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1 November 1949

ar Reader:

We think you'll find the report to management ew Construction Methods Improve Structures, Cut sts" on page 51 helpful. The original stories m which it was digested appeared in *Engineering ws-Record's* 75th anniversary issue. Waldo Bowman, itor of *EN-R*, is duely proud of the section.

Some DIGEST readers have written us asking why, view of our published policy of free original ticles to readers, we ask a premium price for some prints (September's "Better Product Design Means wer Cost" and the story on p 51 of this issue). The wer is cost. These articles were major publishing atures on the part of the originating magazines. is impossible to absorb this cost as the DIGEST es on original articles of other stories digested.

Every three months or so the editors of the GEST publish in the editorial columns "Service to gest Readers" (p43). The reports listed are too ng for proper digesting in the magazine. But the itors feel that they are of sufficient importance t they should be brought to the reader's attention.

John F. Chapman

Publisher

NOVEMBER, 1949

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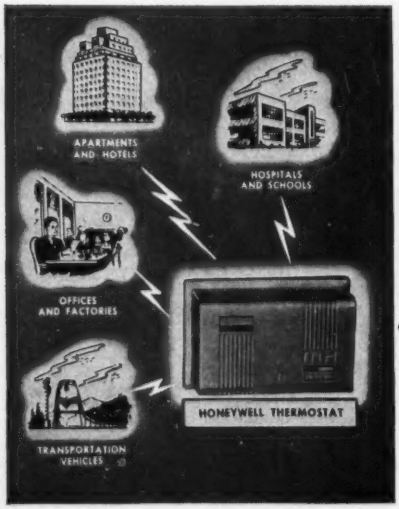

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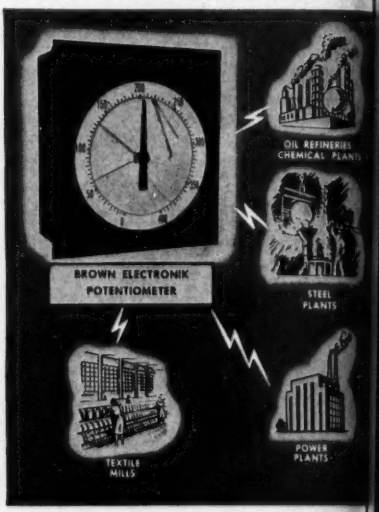

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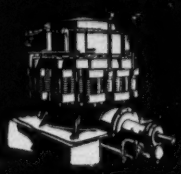

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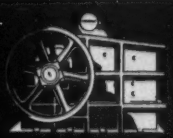

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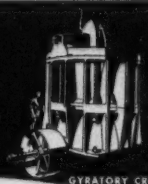

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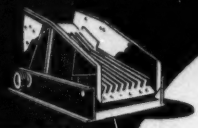

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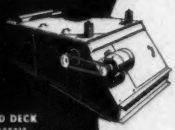

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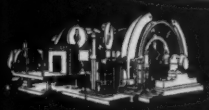

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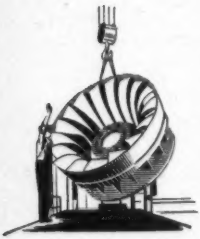

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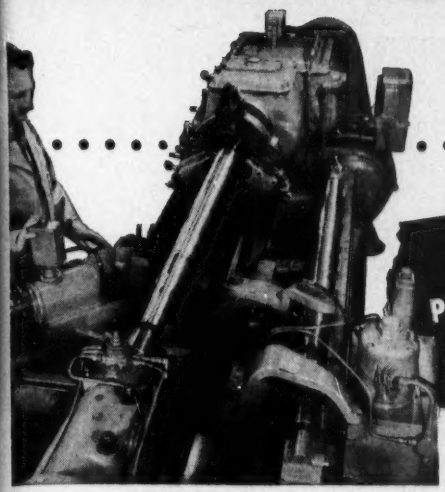

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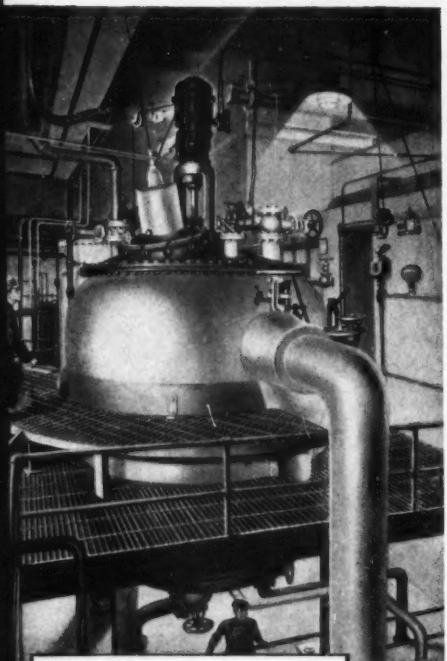

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Business Trends

U. S. BUSINESS, surging ahead now from its summer slump, will soon be tapering off in the usual winter downtrend. In the late fall months, the $19-billion construction industry slows down. Farmers over most of the country are idle. The auto industry shifts over to new models. Retailers' sales reach a peak at Christmas. This year they are expected to come close to the levels of the boom years of 1947 and '48.

The winter slowdown is not a prelude to recession. Since the war, the seasonal downtrend and heavy income taxes have combined to slow business markedly between December and April. Employment is lower. Consumers cut their buying to pay the heaviest installments of their taxes—due in March. Business buying is reduced in the same way.

Key to 1950 business will be industry's plans for capital expenditures to buy new plants and equipment. The economic record shows that when industry is spending heavily to modernize and expand its plants and equipment, general business is good. These business capital expenditures, expected to total more than $18-billion this year, keep employment high and general business healthy.

McGraw-Hill is now making a survey of planned ccpital expenditures for 1950. When this survey is completed at the end of the year, the outlook for the coming year will be sharply in focus. As it looks now, business will keep on buying capital equipment at a high rate in 1950.

Profits have lately been used to finance almost two-thirds of capital expenditures. Now they are down. But, by selling off inventories and holding down customers' accounts, most companies will have more cash this year than last. They will be able to use a larger share of profits to buy new equipment. In fact, contracts awarded for industrial construction have surged ahead since midsummer.

As far as economists can foresee now, the outlook for 1950 is for a year of normal prosperity for the U. S.

CURRENCY DEVALUATION is not expected to boom British and European sales in the American market in the long run. First few weeks brought "flash sales" as importers sold off inventories at sharply-reduced prices. But most commodities—rubber, tin, copper, zinc, aluminum, wool—seem to be headed back toward their old dollar prices. Sterling prices moved upward to bring about the same return in dollars on almost all products where competition allowed it. Production limitations—on such things as Scotch whiskey—prevented expanded sales.

Britain and other nations, in the long run, can only balance their books by selling more in the U. S. But trade figures show that traditional export items cannot be counted on to do the whole job. American experts in the Economic Cooperation Administration and in other government posts expect new gains to come from

Business Trends (Continued)

Europe's pushing new products and from putting much more merchandising effort behind its sales drives.

Traders around the world will not see full effects of devaluation for months. British exporters, for example, cannot set final prices on some products until they allow for two highly important factors: (1) the higher costs of material bought in the U. S. and (2) the slowly developing changes in prices, wages, and transportation costs at home.

U. S. experts see little change in trade between non-dollar countries—and not too much change in dollar trade. The U. S., after all, finances a major part of its exports through the Marshall Plan and other aid programs. Many U. S. products, too, have advantages in delivery schedules or in design that assure them markets. Its capital equipment is needed nearly the world over.

But devaluation is expected to cause other changes and accentuate certain factors that will affect trade. Britain, for example, will probably be allowed to draw dollars from the International Monetary Fund—perhaps as much as $325-million a year. That might result in Britain's easing at least some of the 25% reduction in dollar imports announced this summer and so give a definite lift to exports from the U. S.

Devaluation, too, can lead to freer exchange of currencies and to reduction in quotas and other barriers. Carrying through France's proposal for a monetary union in Western Europe will stimulate not only trade within Europe, but also exports and imports to Europe from non-dollar countries.

Political repercussions of devaluation, in the long run, may affect U. S.-British relations more than will the economic effects. The U. S., for example, seems sure to revise tariffs downward again. Then, too, a general election in Britain that brought a shift to the right would probably do much to clear the way for more American investment.

U. S. COMPETITION—even with its high wages—is hard to meet. This was shown dramatically in a study of food processing costs in India. Comparative costs of producing a pound of canned fruit are about five times higher in India than in the U. S. Direct labor cost, for example, was 0.76 cent in the U. S. against 2.04 cents in India.

U. S. EXPORTS in July dropped to $897-million—almost $200-million under the June figure and the lowest monthly total since last November. With Marshall Plan spending cut back, exports have been expected to taper off slightly this year. But now you can look for devaluation of sterling and European currencies actually to boost U. S. exports slightly for the rest of the year. Dollars earned from increased imports are dollars that will buy U. S. goods.

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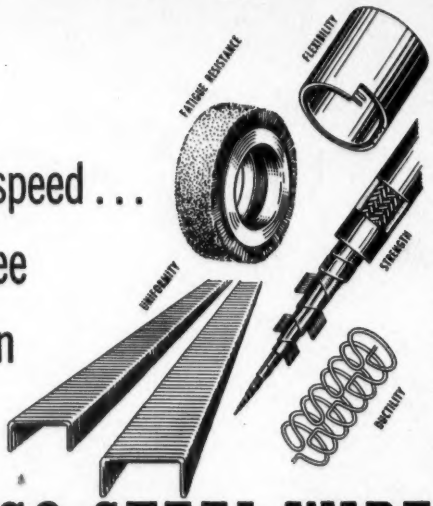

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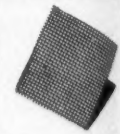

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CF&I EXPORT

Washington Report

AMERICAN-BRITISH-CANADIAN dollar talks have come and gone. The one big accomplishment was the acceptance by the Truman government of a partnership role with Britain and Canada in the job of pulling the sterling area out of trouble. The talks concluded with a 2,500-word communique bright with promises, tasks to be undertaken.

The question now: How far will President Truman and Secretary of State Acheson be able to go, with Congress and with business, in imposing the philosophy that a creditor nation must knock down its barriers to sale of the world's goods in its market?

Some commitments the U. S. made during the talks are relatively simple to carry out. Example: ECA Administrator Hoffman, within a week, approved British purchase of $175-million worth of Canadian wheat with dollars. Also, the U. S. has relaxed minimum use requirements on synthetic rubber as a step toward widening the market for natural crude. Even simplification of customs procedures will be carried out with little dispute.

But trouble on the domestic political scene will be in almost direct inverse ratio to the extent to which western Europe can increase its sales of consumer goods in the U. S. Further tariff reductions (see page 17), on top of devaluation, is certain to bring cries of anguish from U. S. producers. Congress, where traditional protectionist high-tariff sentiment is still strong, will be the sounding board for those with complaints—real or imagined.

Test of how far the U. S. really will go will come (1) in next fall's Congressional elections and (2) when the 82nd Congress acts on again extending the Reciprocal Trade Agreement Act, beyond June 1951.

ONE IMPORTANT LIMITATION on the willingness of even President Truman and Secretary of State Acheson to help build up the sale of foreign goods in the U. S. is this: The U. S. does not want to lose its status as the world's creditor nation. Admittedly, the trade gap is far too large today.

But U. S. government trade economists never want to see the favorable trade balance fall below $1-billion to $2-billion. They would like to build up a continuing program of U. S. private investment overseas which, together with invisibles, would go a long way towards a payment balance.

It was this reasoning in the minds of the American negotiators that put the emphasis on overseas dollar investment into the A-B-C communique.

SENATE REJECTION of the protectionist "peril point" clause and vote to extend the Reciprocal Trade Act to 1951 should not be regarded as a stamp of approval of what President Truman intends to do with the authority. The fact is that the

Washington Report (Continued)

vote turned more on political loyalties than on economic principles. Republican leaders made their insistence on the "peril point" clause a matter of party regularity; that helped hold the Democratic majority in line.

Nevertheless, Truman now has a free hand, until June 1951, to cut duties up to 50% of the 1945 rates. He intends to use that power to promote the sale of European goods in this country. The State Department already is starting work on another round of tariff-cutting talks next year.

MARSHALL PLAN EUROPE is going to have to take concrete, and perhaps painful, steps toward economic union if there is to be any hope that ECA will continue beyond the fiscal 1949-50 year. Congress feels that way about it—and that is where the money comes from. So does Hoffman—and he runs the show.

Hoffman devoted his late-summer European trip to impressing on the ministers the necessity for action sooner rather than later. To back up his urging for action, Hoffman has set aside a $150-million special allotment of ECA funds to be available to the first group of nations that make their currencies freely convertible among themselves. The money can be drawn on by nations in the group that need it to balance out payments with the others.

Hoffman also is threatening to re-apportion January-June, 1950, ECA dollars and cut down portions to nations that will not cooperate in freeing intra-European trade, currency, and migration. The goal of both these policies is to speed the day when west-Europe is an integrated producing area and a single market of 275-million consumers.

POUND DEVALUATION delighted official Washington, especially the $2.80 rate. The U. S. Treasury has feared the British would pick a $3.20 rate, or thereabouts, and thus ruin any chance that it would do any real good. Washington officials however still believe that unless the British follow through with concrete steps to increase productivity, lower costs, and improve merchandising, Britain within a year will be as bad off as ever.

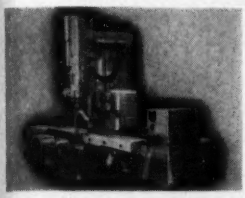
Regardless of these moves, U. S. trade experts estimate it will be about 6 months before devaluation will begin to make itself felt. They expect the export volume to dollar areas to pick up quickly, but because of lower prices it will take a while before dollar receipts get back up to the August level. They look for a drop in U. S. exports of textiles and manufactured chemicals, among other things. They expect Britain and Belgium to gain in this market.

Treasury Secretary Snyder is not considering a stabilization loan from the U. S. to back up the pound's new rate. He figures it will not be necessary, particularly with re-establishment of Marshall Plan country drawing rights on the International Monetary Fund.

P&W CAN SUPPLY EXACTLY THE RIGHT EQUIPMENT FOR PRODUCING . . .

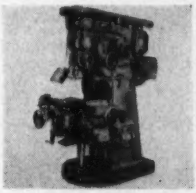
FORGING DIES • BLANKING DIES • DRAWING DIES • DIE CASTING DIES

MOLDS FOR PLASTIC • MOLDS FOR GLASS • METAL PATTERNS



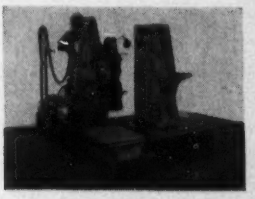
1. P&W JIG GRINDER

Locates, finish-grinds to "tenths" in hardened steel, then checks its own work.



2. P&W DIE SINKER

Accurately machines forging die cavities at low-cost-per-die.

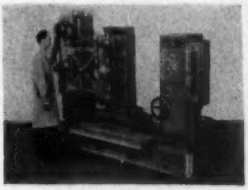


3. P&W KELLER MACHINE

Automatic, accurate tracer-controlled milling for making original and duplicate dies.

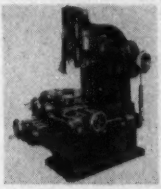
4. P&W JIG BORER

Key machine for precision locating and boring in all types of die and mold work.



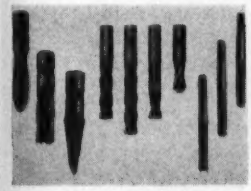
5. P&W AUTOMATIC DUPLICATING MACHINE

Ideal for automatically duplicating forging dies and bottle molds.



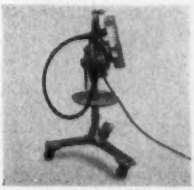
6. P&W VERTICAL SHAPER

For shaping contours, reliefs in blanking, trimming dies and similar work.



7. P&W CUTTING TOOLS

for P&W Machines. Precision-made. Precision-inspected. Performance-proved.



8. P&W KELLERFLEX

Flexible Shaft Machine for die and mold finishing. Choice of 16 constant shaft speeds.

9. P&W GAGES

P&W Gages cover entire range of measuring equipment to establish and maintain essential accuracy.

Pratt & Whitney

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Make your selection from these "Right Tools For The Job". P&W die and mold making machines and equipment can solve your problems with greatest economy and finest results. We welcome the opportunity to study your work.

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Announcing . . .

A New Low-Cost Process for Production of

WELDED PIPE . . . *in sizes from 8⅝" to 30" O. D.*

Initial Investment Reduced by **60%**

This completely new process embodies equipment for cold forming of skelp in specially designed hydraulic presses, and welding by the submerged arc method; also auxiliaries for conveying, processing, and finishing pipe in 40' lengths, in the range of sizes indicated above. All the equipment, with minor exceptions, is engineered and built by Yoder.

A pioneer plant, in commercial operation for over a year, already has demonstrated high dependability, with exceedingly low production and maintenance cost.

From an operating standpoint it is thought that the most desirable tonnage requirements for the new type of mill will lie between 50,000 and 75,000 tons per year. With the addition of more welding units, the production may easily be raised to 125,000 tons.

Initial investment, maintenance and operating cost are so low that profitable operation under favorable circumstances may be maintained *on a production as low as 15,000 tons per year, or even less.*

Notable features of the new process are: Exceedingly low scrap loss and tooling cost; wide range of sizes which can be produced in the same mill, with one basic set of tooling; short set-up time for different sizes; small amount of operating skill required. (Low scrap loss is especially important with operators not producing their own steel plate.)

Biggest single consideration, however, for production within the limits mentioned, in most cases will be low initial investment in plant equipment—only a small fraction of that necessary with any of the older processes of pipe making.

Where greater production is required, Yoder electric-weld Tube Mills, now as in the past, remain the most efficient and economical for sizes from ¼" up to 16" O.D., or larger.

Detailed information may be had for the asking. Your inquiries will receive prompt and careful attention.

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U. S. Tariff Barriers May Drop

Cuts on many manufactured goods will come by September 1950—perhaps sooner. Administration wants to augment dollar earnings on exports to U. S.

NITED STATES tariff rates are due to rop. Manufactured goods will be the rst to benefit from cuts made under the eciprocal Trade Agreements Act. Sepmber 1950 is the date tentatively set r the lowering of rates. But they may me before then.

In mid-September, when Administran leaders obtained Congressional perission to extend the trade agreement ithout inclusion of the "peril-point" ause, the Administration began thinkg of tariff cuts. The Administration els that cutting tariffs is a good way assist Britain and Western Europe in creasing their exports to this country d thus to boost their dollar earnings. Washington economists believe that if e U. S. wants to continue selling more ods to Europe it must buy more. Deluation was a step in the right direcn. Tariff cuts will be a great impleentation to the short-term advantages at these countries received upon devalation of their currencies.

World-Wide Cuts Possible

The tariff section of the U. S. State ept. has its eyes on more than just ritain and Western Europe. It would ke to see tariffs on Canadian and even erman and Japanese goods lowered.

Since establishment in 1934 of its reiprocal trade policy, the U. S. has made riff concession on the basis of "prinpal suppliers." That is, if the country as ready to cut import duties on one ype of goods, it would first make a riff concession to the principal supplier f that goods. After this agreement was eached, concession with secondary supliers would follow.

Before the war, Germany and Japan ere principal suppliers of certain goods.

	Tariff on Jan. 1, 1949 %	Lowest duty Permissible %
Cotton manufacturers	23.4	14.4
Woolen floor coverings	40	30
High-grade worsteds	34.8	24
China (25% bone)	35	22.5
Intermediate coal-tar products	44.4	22.2
Women's leather handbags	20	12.5
Machinery (excl. farm equipt.)	15	13.8

They are still considered as such. So tariff cuts have been impossible on the list of goods of which these two countries are considered principal suppliers.

No longer are Germany and Japan the principal suppliers of many of these goods. Britain, Belgium, or France may have replaced them. But so far concessions to these countries have been impossible. Thus the State Dept. desires to rewrite concession with Japan and Germany.

It is possible that the Administration may decide to negotiate concessions on the basis of second or third suppliers.

Manufactured goods present the greatest leeway for cuts. In some cases the President is authorized to reduce tariffs as much as 50% from present rates. This authority stems from the 1945 renewal of the trade act. There are at least 250 items important to European economy on which tariffs might be lowered. The complete list of permissible cuts has not yet been worked out.

There is no doubt that the Administration has adopted a new philosophy on tariffs. Secretary of State Dean Acheson believes exports can be helped indirectly by increasing our imports.—Business Wk, Sept 24, p117

How To Cut Costs

Product vs. Process Layout

When to Use . . .	When to Use . . .
. . . Process Layout	**. . . Product Layout**
1. Many types or styles of products	1. One or few standard products
2. Low production on individual items	2. High production of individual item
3. Many operating inspections required	3. Few operating inspections required
4. Difficult to balance labor and equipment	4. Good labor and equipment balance
5. Hard to make time and motion studies	5. Time and motion studies can be made
6. Much heavy or special equipment	6. Minimum of heavy equpiment
7. Bulk handling materials not possible	7. Bulk handling of materials possible
8. Frequent need to use same machine or station on several operations	8. Same machine or work station not usable on several operations

Cut Costs With Best Layout

In planning you must consider moving and handling costs. Flexibility of layout adds to long-range cost cutting

ADOPTING the "one best" plant layout offers plant operating men one of their foremost opportunities for cost reduction. This one best layout minimizes material moving and handling costs, which really add only to the cost of the final product, not its value. However, it must be kept in mind that long-term, lowest-cost layout requires pre-planned flexibility for expansion, consolidation, new products, and new methods.

Layout embraces, in addition to placement of machines, methods of production and materials handling. To do the most effective job, the layout engineer must be free to suggest changes in methods of handling and production. Primarily, the task is to find the "one best" route from receiving dock to shipping platform through the shortest possible distance, in the shortest possible time, and at the lowest possible cost.

The lowest possible cost factor requires compromise with the "shortest distance" and "shortest time," even in a static situation. However, no static situation really exists because products, methods and techniques change constantly. Hence the need for flexibility.

Product vs. process control is the first layout problem. Continuous process industries use product control. The arrangement of machines in this type layout parallels closely the sequence of operations to fabricate the product. Process control, on the other hand, is used for industries engaged in intermittent or job manufacture. Grouping of machines and stations is by common operation.

With exception of continuous process industries, it is difficult to find product or process control in their pure form. In most instances it is a combination or interweaving of both. The decision of which control to use where is seldom simple. Some of the factors to be considered are listed in the table above.

The first step, therefore, is planning the layout. Six tools, described below, help the engineer determine limitations within which he must work.

Operation analysis—Three items are mainly considered here, excluding a study of motion economy within the individual operation. The first is an accurate estimate of the time required for a complete operational cycle. Second, an accurate scale diagram of the workspace layout. Third, a catalog of special equipment and facilities needed.

Flow process charts—These, of course, are only handy forms on which to tabulate "what happens" to a product in its operational sequence.

Flow diagram—This diagram is an aid in visualizing the flow process chart.

Geographical building inventory—The four elements of this inventory are: blueprints, clearances in the building, load limits, and service facilities.

Geographical equipment inventory—The engineer must know what equipment is available and where it is located.

Geographical transportation inventory—Here it is determined what transporting equipment ranging from tote pans to cranes is available and where.

Having compiled the above data, the layout engineer may now plan the new layout. Though many aids have been developed, this is still a cut-and-try process. The initial steps are primarily paper planning.

Charts Suggest Groupings

Study of process charts will suggest some natural groupings of machines. Where process control predominates, the task of planning a layout consists of merely grouping the machines, providing storage space and minimizing backtracking.

Product control layout is more complex. The first step is to set up, on paper, balanced production lines. Once this has been done, the major problem is placing equipment and deciding what handling equipment is needed. This step may be approached in several ways. Where the problem is simple, such as in small plants, drawing and sketches may prove adequate.

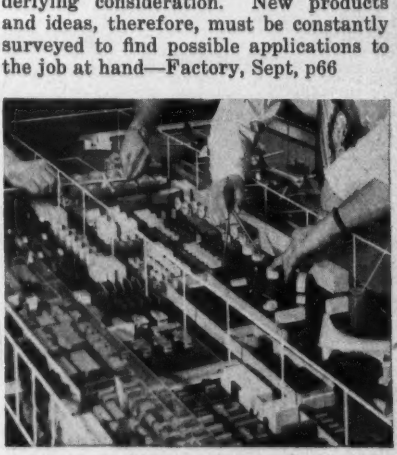
Three-dimensional scale models are mostly used for layouts in buildings being constructed or wherever the cost warrants them. These usually consist of a model of the floor area or of the entire building with models of equipment properly placed. Great flexibility is offered by scale models, but the costs are often prohibitive to their use. Models of virtually any standard item of equipment are now commercially available.

Color Codes Helpful

Because drawings and templets do not differentiate product lines easily, color codes are used. Color-by-process is used in layouts that are predominantly process controlled. In color-by-product, a different color designates the equipment involved in each product or major subassembly.

Often photography is used to record tentative layouts and present them to management. Although it is best adapted to use with scale models, it is also applicable to templet layouts.

In planning layouts, it must be remembered that flexibility is the principal underlying consideration. New products and ideas, therefore, must be constantly surveyed to find possible applications to the job at hand—Factory, Sept, p66



SCALE MODELS permit the most flexible method of layout planning. Though expensive, some situations warrant their use.

Planned Selling = Good Selling

Large volume of business depends upon coordination between management and salesmen. Salesman must know production, customer, product, sel

SELLING IS BECOMING HARDER. Today the good salesman must know more about production, his customer, his product, and himself. It is management's business to give the salesman what he needs.

Sales are up over 300% in the past 10 years. Selling force is up only about 25%. This means each salesman must do more selling and do it better.

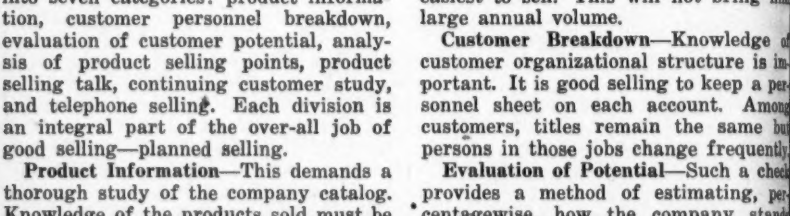
"Planned Selling" can be broken down into seven categories: product information, customer personnel breakdown, evaluation of customer potential, analysis of product selling points, product selling talk, continuing customer study, and telephone selling. Each division is an integral part of the over-all job of good selling—planned selling.

Product Information—This demands a thorough study of the company catalog. Knowledge of the products sold must be accompanied by a knowledge of the application of those products and how the product operates. A study of products as related to industries and plant operations gives a salesman an insight into the background of manufacturing.

Salesmen with large dollar sales gain them through the sale of a wide range of products. It is easy for a salesman to become prejudiced in favor of products easiest to sell. This will not bring him large annual volume.

Customer Breakdown—Knowledge of customer organizational structure is important. It is good selling to keep a personnel sheet on each account. Among customers, titles remain the same but persons in those jobs change frequently.

Evaluation of Potential—Such a check provides a method of estimating, percentagewise, how the company stands



LOUVER CEILING PROVIDES FLEXIBILITY, EASY UPKEEP

Extreme flexibility of lighting and easy access to tubes and for mechanical services are provided by this new development in louver ceiling. Called "Flexi-Module", the system, composed of various electrical lighting and architectural units, was developed in co-operation with Sylvania Electric Products, In Ceiling is composed of panels 32 in. squa and with 3-in. cells. Each panel is suppor at its four corners by suspension rods w leveling devices for small adjustments.—E World, Sept 10, p92

relation to a customer's over-all buying. It shows a salesman how he may increase volume on an account. It sets sales goals for each salesman. The customer's estimated yearly purchases must be shown as to individual items or products. Against this record are compared the estimated sales for the year to that customer. At the end of the year a tabulation will show how far above or below estimates the salesmen came.

Analysis of Selling Point—A product study form will provide the salesman with: a standard procedure for breaking down and analyzing specific products; a method to evaluate product's selling points; a means to clarify distinction between technical and customer benefits; and information on which to establish fundamentals of a product's selling talk.

Seven factors must be shown on the form: structure points, performance points, customer problem points, customer benefit points, points of anticipated objection, proof or confidence points, and closing points. The order listed is important. It proceeds from a study of the technical aspects of the product to the customer's benefits.

Product Selling Talk—Selling can be reduced to a formula. Good salesmen, successful salesmen have used it for years—many subconsciously. Those salesmen who say that they sell "off-the-cuff" and each sales talk is different are the salesmen with low annual volume. The formula: (1) gain attention, (2) develop interest, (3) build up a "want," (4) deal with objections, (5) present proof, (6) build confidence, and (7) close the sale.

Continuing Customer Study—Call reports are the basis of a continuing study of clients and prospects. Made in triplicate, the reports give a call-by-call history of each account. They give the advertising and sales promotion departments assistance on specialized promotional mailing lists. They show management how to assist a salesman in building increased sales.—Ind Dist, Sept, p81

Welds Cast-Iron Press by . . .

. . . *Damming* . . .

CARBON PLATES are built around weld area to retain molten and parent metal

. . . *Preheating* . . .

Bracket area on frame is preheated to 1400° F. in 3 hr.

. . . *and Welding*

Operator welds bracket through a small hole in the asbestos covering it to confine heat.—Welding Eng, Sept, p32

Employment Tests Match Man to Job in Industry

Improved job placement has led to reduced training time and decreased turnover at National Cash Register Co. Tests used there since 1946 determine the position a man should occupy in the factory. However, continual improvement and reevaluation of the predictive accuracy of the tests have been necessary.

In a typical situation, four job levels were studied: (a) moderately difficult assembly, (b) highly-difficult assembly, (c) final inspection, and (d) miscellaneous assembly. Three tests were used: general intelligence, practical intelligence, and space-form thinking.

All the men selected had taken these tests at the time of employment. Each man had been placed in a job according to test results. Consequently, each man was rated on his job for work accuracy and work output.

The scores of both tests and ratings were then plotted on scatter diagrams. These showed that 95% of all the men exhibited good relationship between their test scores and performances. Thus, a definite value can be attached to these tests in predicting ability for those jobs. —Factory, Sept, p123

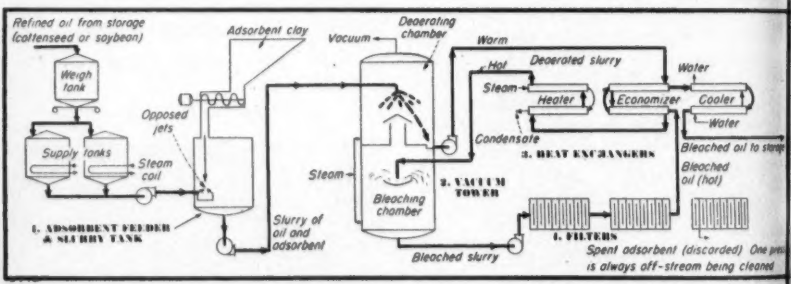
Core-Sand Mixing Cycle

Investigation by Werner G. Smith Co. of mixing cycles for foundry core sands indicates that order of ingredient addition is of utmost importance. Test ingredients were core oil, cereal binder, tap water and lake sand of 43 AFS grain fineness.

The best method of addition was cereal-water-oil. This order of addition results in the best green and baked bond. Next highest tensile strength was developed when all ingredients were added at one time.

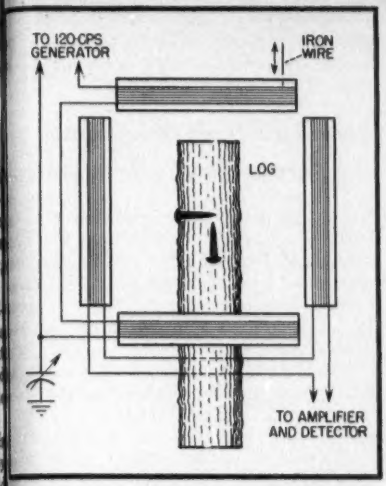
The reason for the different results is the bond development brought about by combination of pregelatinized cereal and water in the mixture. When cereal and water are mulled together and form a paste, green and dry strengths are high.

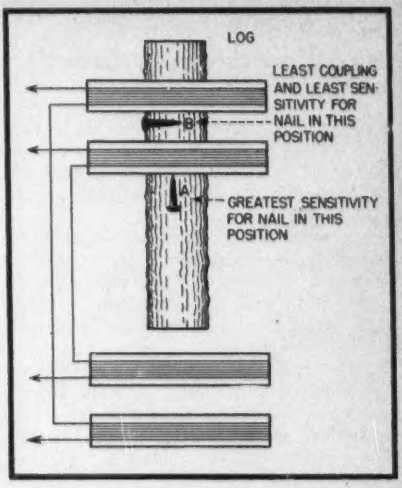
When cereal and water do not form a paste, strengths are low. This happens when oil is added first and coats the sand grains.—Foundry, Sept, p75



CONTINUOUS VACUUM BLEACHING OF VEGETABLE OILS

Vegetable oils (cottonseed and soybean), ordinarily bleached batchwise in open kettles, are continuous vacuum bleached at Mrs. Tucker's Foods, Inc. Advantages: produces oils of lower color value and greater stability, uses less adsorbent, prevents rise of free fatty acid, reduces soap content, improves product flavor. Main equipment items in process are: (1) adsorbent feeder and slurry tank, (2) vacuum tower, (3) heat exchangers, (4) filters. Slurry from slurry tank is deaerated in vacuum tower, passed through economizer and heater back to tower for bleaching. Bleached oil is filtered, partially cooled in the economizer, then finish cooled —Chem Eng, Sept, p102





IMPROVED SETUP TO DETECT METAL IN LUMBER

Two mutual inductance coils with a Felici bridge are used to detect metal in logs. In the common arrangement, shown above, metal objects driven radially into a log are not always detected.

With four coils arranged in the above fashion, metal fragments in any position are easily detected. Operation is not affected by varying temperature and humidity.—Electronics, Sept, p100

Vaporized Metal Coatings Now Applied Commercially

Before the war, high-vacuum deposition of metals was mainly a laboratory tool. Today, high-speed vacuum pumps, high-vacuum valves, high-boiling-point oils, and other new equipment have transformed the process to a commercial one.

Principles and methods are essentially simple. Metal is heated in vacuum to a temperature above its boiling point at the existing ambient pressure. The metal then evaporates and discharges into space, forming a continuous film on any object on which it impinges. If pressure is not low enough, the gaseous metal will form as a dark powdery deposit on the surface to be coated.

Applications of metal evaporation include production of front-surfaced mirrors, gold-leaf paper condensers, coatings on plastic sheets, lens coatings, and coatings for master records. Some material combinations are aluminum on glass, zinc on paper, and silver on cellophane.—Am Mach, Sept 3, p118

Resins Coat Kraft Paper

A method to coat kraft paper with synthetic resins, usually polyethylene, has been developed by St. Regis Paper Co. and Du Pont. Major application will be for multiwall paper bags.

Characteristics of the polyethylene multiwall bag make it a superior container for packaging hygroscopic materials and for protection of fresh-packed quality of food. Tests on the efficiency of the coating included packing of meat trimmings, calcium chloride, synthetic resins.—Paper Ind & World, July, p451

Long Booms, Tower Pour High Concrete from Ground

Four ten-story apartment buildings were built by MacDonald, Young & Nelson, Inc., using only two booms and one Mixermobile tower. The tower was 116 ft. high. Booms on cranes were 115 ft. and 110 ft.

Only one set of forms was needed because the building was clean cut all the way up. They were faced with plywood and coated with a lacquer-type protectant. After two or three uses, forms had to be re-lacquered.

All forms were hoisted by the cranes from the ground floor. Interior forms for walls and floors, when stripped, were assembled in bundles and rolled through the windows to be hoisted to the next floor.

The tower on the Mixermobile was built up as the job progressed. However, in moving it from building to building, the maximum height transported intact was 60 ft. The rest of it was transported on small trucks.

Had the buildings been higher than 10 stories, the equipment could not have worked from the ground. For brick-faced or steel framed buildings, other procedures would have had to be used.—Cons Meth & Equip, Sept, p46

Disk Brake Self-Energizing

An entirely new self-energizing disk brake will soon be introduced as standard equipment on Chrysler Corp. Imperial models. The brake is self-compensating, requiring no service adjustments during the life of the lining. The new brake provides 30% greater lining area, better cooling, and greater rigidity.

Brake consists of two flat pressure plates with six steel balls placed between them in sockets. When brakes are applied, the outer plate is rotated by two hydraulic cylinders. The balls are thus pushed out of their sockets and onto small ramps in the plates, forcing the plates apart and into contact with the inside surfaces of the rotating brake housing.—Auto Ind, Sept, p26

Cost Analysis Proves Space Heaters Are More Economical

Salamanders, metallic boxes open at the bottom in which coke is burned for heating, were long thought to be the best method of heating large industrial structures. However, a cost analysis at the Rosedale Foundry & Machine Co. disproved this point.

It was found that gas-fired space heaters would provide better heating at a lower cost. When salamanders were used, many parts of the building were cold, while others were overheated. Noxious fumes often made conditions unbearable. Further, salamanders needed extra men to keep them fueled with coke, increasing expenses. All these conditions are alleviated with the heaters.

With the gas-fired space heaters annual savings for the first 4 years was $402. At the end of 4 years, when heater costs are amortized, annual savings will be $4,372.—Factory, Sept, p116

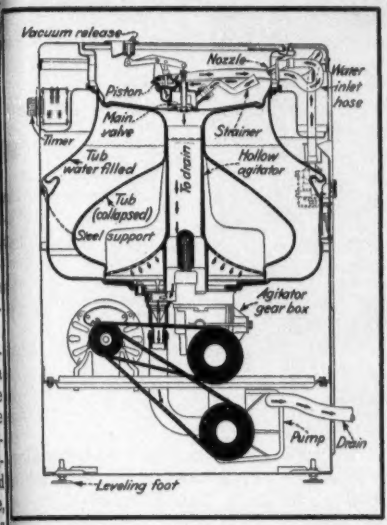
Stall Warning Data Correlated

Pilot's opinions have been compared with data from instruments installed in the plane in order to obtain quantitative design specifications for stall warnings. The amount of elevator shake and buffet showed no correlation, possibly because of friction in the control system. Normal acceleration, rolling velocity and elevator-control position produced a consistent quantitative measure.

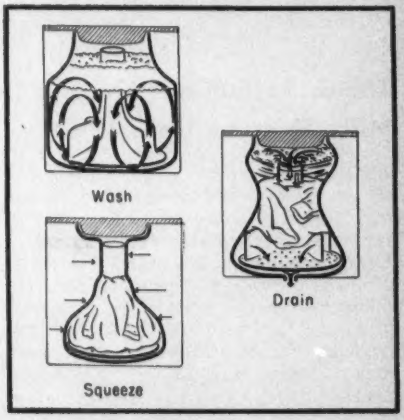
Buffeting was not a satisfactory stall warning above 15 mph. and below 3 mph. above stall speed. Data on the rolling motion preceeding stall indicated that the velocity must be between 0.04 and 0.06 radians per second to be satisfactory stall warning.—Aviation Wk, Sept 12, p21

Design Washer For Lower Price

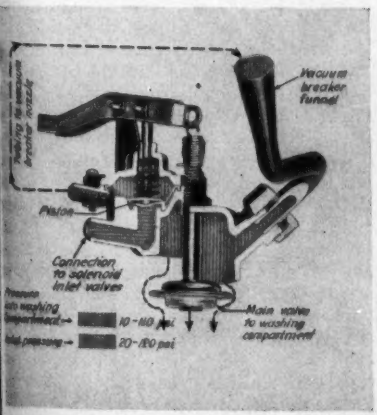
Departures from conventional washer design in the Bendix "Economat" have contributed to its low price. In place of a spinning basket, washer uses a flexible rubber tub to squeeze water from clothes. Other cost-saving elements are overrunning clutches, reversible motor, water-powered vacuum release.—Prod Eng, Sept, p106



REVERSIBLE, split-phase motor drives both agitator and pump pulleys, which have overrunning clutches. Solenoid valve cuts pump in or out of system as needed.



WASHER is top-loaded. After water and air are pumped from machine, rubber tub collapses against wet clothes, squeezing them. High-speed spin is thus eliminated.



VACUUM-RELEASE assembly uses water power to open main valve. Finger button at top of washer releases tub vacuum.

ONE-PIECE flexible rubber tub holds water and clothes. Steel support limits tub's expansion when filled.

ELECTRONICS HELP WASH BUS

Bus is driven between two guide rails spanned by a photo-electric beam. When bus is in position, washing machine, consisting of a horizontal trough, descends and embraces it. Water is sprayed on, while revolving flaps remove dirt and mud.—Electronics, Sept, p116

Trends in Sulphite Pulping; Mills Shift to Hardwoods

Scarcity, poor quality, and high prices of non-resinous softwoods have forced some sulphite paper mills to shift to hardwoods, particularly birch and maple. Advantages: high yield and low cost. Disadvantages: low-strength paper.

Paper strength can be improved, either by mixing hardwood and softwood pulps, or with the "Curlator" process (see McG-H Digest, May, p37). The development of this process has made possible the manufacture of newsprint sulphite from high yield hardwoods.

Other mills are trying to solve the problem of scarce softwoods by improving methods of treatment, thus increasing yields. Some mills have increased yields from 47-52% without reducing paper quality.

Their method is to step up concentration of acids and digester pressures. This is combined with forced circulation, indirect cooking, and a hot acid system. Further experimentation promises even higher yields—up to 72%.

Semichemical pulping using hardwoods is being tried in the South for the production of boards and corrugating. The process is carried out in a slightly alkaline cooking liquor—a combination of sodium carbonate, bicarbonate and sulphite. The pulp is dark in color and must be bleached. Yields as high as 70% are not uncommon with this process.

Market mills have had no trouble making the shift to hardwoods. Integrated sulphite mills have found it more difficult. The change affects the quality of the product. The paper is not strong and the pulp must be bleached. Proper type of refiners will raise the quality.—Paper Ind & World, Aug, p614

Cathodic Vacuum Etching

Ford Motor Co. has developed a new etching process for preparing metal surfaces for microscopic examination. Known as cathodic vacuum etching, it utilizes argon ions as the etching agent.

The metal sample is placed under a bell jar, air is evacuated, and argon is admitted. Electrical discharge at 12,000 volts between specimen and an electrode ionizes the argon. Ions then bombard the specimen surface, removing minute particles and so etching the surface.—Foundry, Sept, p132

ood Light Raises Fleet aintenance Shop Efficiency

ight in most truck fleet maintenance ops permits mechanics to see, *but not see well.* The insufficient light is re-cted in higher operating costs and poor ality maintenance.

Recommended illumination for various op sections is: general lighting, 30 ot-candles; repair dept., 50 ft.-c.; work-g dept., and machine and paint shop, 0 ft.-c.; stock room, 20 ft.-c.; pits, 50 -c.; welding, 1,000 ft.-c.; and stairways d hall, 5 ft.-c.

In work areas, units should be mounted illuminate flat areas, vertical plain be-g most important. Units directed -50° from the vertical will focus proper ht on these surfaces. Pits for under-assis repair should have light fixtures cessed in pit walls. If lifts are used, her wall-mounted or movable units e best light on plane of work.

Spray-department lights should be out-de the booth. Angle brackets and angle flectors are recommended. Channel-pe reflectors over the entire bench length are most suited for bench repair work. Full-length units should be supplemented by intensifier units for grinder, lathe, drillpress, or other detail work.—Fleet Owner, Sept, p39

Double Turboprop Built

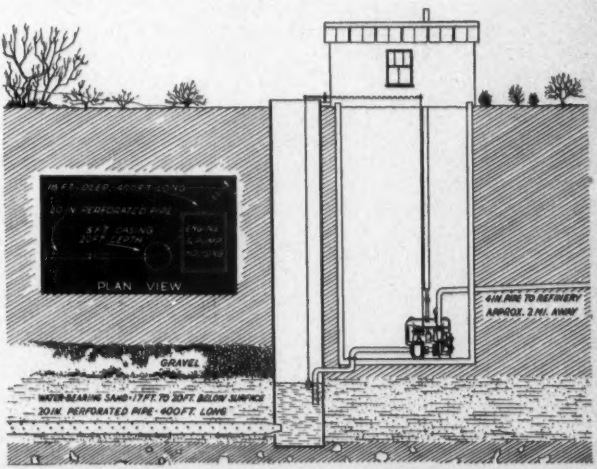
Armstrong Siddeley Motors Ltd. has developed a double turboprop engine, basically two Mamba IIs placed side-by-side. Engines are joined at the front end and use the same air intake and propeller-shaft reduction gear casing. Otherwise they are separate engines using their own fuel supply, lubrication, and controls.

Either engine can be shut down and restarted independently depending on power requirements. Each engine develops 1,270 shp. and 400 lb. jet thrust. Port engine drives the front propeller and the starboard the rear propeller in a contra-rotating propeller arrangement.

Reduction of both engines is through a compound elliptical gear train. Fuel consumption is said to be low when cruising; power to weight ratio for maximum power operation is high.—Aviation Wk, July 18, p21

HORIZONTAL WATER WELL

aggoner Refinery, xas, gets 2,500 bbl. water daily from 3 of water-bearing nd. Principal feature use of two 400-ft. gths of 20-in. pipe, bedded in the water nd 18 ft. beneath the rface. Slots, ¼-in. de, are staggered ound the pipe to al-w water to seep in m the sand. Gravel lps to keep slots m being clogged ith dirt.—Oil & Gas Aug 25, p106


PLAN VIEW
GRAVEL
WATER-BEARING SAND-17 FT. TO 20 FT. BELOW SURFACE
20 IN. PERFORATED PIPE-400 FT. LONG
4 IN. PIPE TO REFINERY APPROX. 2 MI. AWAY

LINE-DRILL MACHINE, powered by compressed air, drills six holes in pavement at one time. This is one example of many on how construction . . .

Mechanization Reduces Costs

Electric-utility construction has been made cheaper and quicker development and use of special purpose construction equipm

INTENSIVE MECHANIZATION is saving the Cleveland Electric Illuminating Co. (power utility) several hundred thousand dollars annually. This is done through reduced maintenance and capital investment costs resulting from development and adaptation of heavy construction machinery.

The program, begun after the war, was based on the belief that the correct machinery properly applied would reduce costs and, in most cases, complete the job faster and safer. The first part of the program was directed to underground construction operations because much material had to be moved and manual labor was scarce.

In cooperation with an air-tool manufacturer, a machine was developed for street-pavement removal. It has six penumatic rock drills on a pipe frame mounted on a tractor. A 600-cfm. diesel-driven air compressor was attached to the tractor to supply air to the drills.

The machine perforates the pavement by drilling a line of six holes on 1 centers. It is then moved forward ab 4 in. and more holes are drilled. Repe ing this operation produces a continu line of holes on one side. Another is drilled on the other side at desi trench width.

The web between drill holes is cut by a broaching device developed for t specific job. These two operations le a loose continuous slab of pavement wide as the trench to be dug.

This slab is hard to handle, so anot manufacturer was consulted. The swer was the Gradall machine McG-H Digest, Oct, p44).

Equipping the Gradall with a spe bucket enabled 15-ft. slabs of paven to be picked up and loaded into tru The boom-and-bucket assembly on machine has the facility of a human and hand.

With line drill, broach, and Gra machines, cost of pavement removal reduced to about 15% of the former

th jack hammers and hand loading. e Gradall also reduced cost of excaing the trench—about 95% less than h hand shovel work and 30% less than h conventional trenching machines. Another recently added mechanical per is a pneumatic machine to drive ine through underground cable ducts. hoots a neoprene cup and following e through a 600-ft. duct in 2 min. t of the operation has been reduced %, and the work speeded up in about same proportion.

One of the newest applications is use a tilt-bed trailer, which hauls tractors l bulldozers needed in building highsion, steel-tower lines. Previous cost 50 a move has been reduced to $10. Other new types of equipment are ng added as they become available. pervisors are asked to decide on the rchase of a likely piece of equipment applying this simple test: (1) Will it k? (2) Will it pay? (3) Is it safe? Elec World, Aug 27, p91

otects Roofing Materials

new liquid roof coating that can be lied by brush or spray has been deoped by Grems Mfg. Co. It is a cessed hydrocarbon with aluminum or per paste and a solvent.

When this paint-like substance is apd to a roof, the solvent evaporates, ing a comparatively thick, elastic ing with a brilliant metallic finish. e polished foil, the material (called malume foil) reflects radiant light heat up to 75%.

y stopping sun's rays the compound y almost eliminate the necessity of lacing asphalt-type roofs.—Chem , Aug, p86-PPI

Plant Chlorination

ak-point chlorination has given conrable impetus to use of chlorinated er in food plants. Many industries, uding brewing, dairy products, meat, and confectionery, have adopted the system. Chlorinated water in cleaning systems prevents rapid build-up of the bacterial "load," thus cutting costs from cleaning delays.

Here is a typical application:

In shellfish plants, fish are put in heavily chlorinated water for 48 hours to allow them to draw in the water through their systems. This lowers the danger from the dirt these fish bring into the plant.—Food Ind, Sept, p59

BOLTS HOLD BAD TOPS

Roof suspension bolts and expansion shells have reduced falls in Pittsburgh-Seam Mine 80%. Bolts are 5½ ft. long and ⅝ to ¾ in. in dia. They have stopped cutters at intersections when used to supplant crossbars in Sewickley-seam operation.—Coal Age, Sept, p92

New Die Alloy Successful

A new copper-base alloy, Ampco 24, is proving of significant success as a die material for metal forming. In one application of drawing stainless-steel cooking utensils, it gave lower costs because of 100% better die life, 45% lower maintenance costs, and 25% lower belt-sanding and polishing costs. It is made by Ampco Metal Inc.—Steel, Sept 5, p84

Tool Engineers Handbook

The art and science of analyzing, planning, designing, constructing, and applying the means and equipment for the mechanical production of industrial and consumer goods. That is tool engineering.

To it has been devoted more than 2,000 pages in this all new reference book. Sponsored by the American Society of Tool Engineers, the handbook covers all phases—from product development through manufacturing.

All new important techniques and processes are included. Conventional tables of feeds, speeds, and cuts bring data in line with recent advances in today's high-speed, high-powered machine tools, cutting materials, and practices.

Written by 152 recognized authorities in their fields, the handbook is published by McGraw-Hill Book Co. and sells for $15. Much of the material, from industrial company manuals and confidential files, has never before been publicly available.

Three-Unit Wool Card

The Newport News wool card is a three-card set consisting of a breaker, intermediate, and finisher card. Machine has a wide speed range enabling it to accommodate all types of materials and to rove the coarsest and finest counts.

Breaker-card unit has automatic feed, a large hopper, and an accurate weighing mechanism. The intermediate card includes a broad-band feed for thorough blending giving a more economical use of stock. Finisher card also includes broad band feed.

Each of the units feature a large doffer. This produces better carding which results in stronger yarn at higher production rate with less frequent machine downtime for stripping.—Textile World, Sept, p167

How To Gain Working Space in Existing Buildings

If more production and storage space is needed, these suggestions should be considered before new buildings are planned:

1. Use mechanical handling for high stacking in stores.

2. Consider overhead handling and construction of mezzanines.

3. Subcontract work if it is economical and delivery dates can be met.

4. Use outdoor storage and consider outdoor production.

5. Build cheap sheds for storage of spare machines, parts, maintenance materials.

6. Reduce inventories by careful receipt scheduling and improved order follow-up.

7. Make full use of storage space under assembly tables and conveyors.

8. Keep only working inventories in work areas.

9. Evaluate all space and arrange feeder departments for small components in low-headroom areas.

10. Ventilate all equipment that throws off fumes and dust so it does not require excessive surrouning space.—Am Mach, Aug 25, p79

Runs First Plastic Tubing

First string of all-plastic tubing ever to be used successfully by the petroleum industry in any type well was run recently into a salt-water disposal well in Kansas.

The string was 3,387 ft. of 2½-in. extra-heavy threaded plastic tubing. It weighed 1¼ tons in comparison with 17½ tons for the 3-in. cement-lined steel tube usually used for this service. Running time was 4½ hr.

The pipe, developed by Green Contracting & Engrg. Co., Inc., in conjunction with Carter Products Corp., is made of cellulose acetate butyrate.—Oil & Gas J, Sept 8, p37

What Delays New Products From Idea to Actual Use

A long delay exists from idea to production of new developments. Two now common products that emphasize this delay are the high-vacuum tube (idea—1913; use—1921) and induction heating (1919—1939).

These delays can generally be attributed to seven main reasons: (1) instinct of engineers to hold back products until they understand them completely; (2) overlooked defects; (3) attitude of trial users; (4) not enough forward looking on part of designers; (5) personal and business interruptions; (6) general weariness and disgust with the project; (7) natural public opposition to new things.

In addition to these reasons, new products are often not timed right. The times most difficult to promote an idea from conception through production are when business is good and when business is dull. Reasons are psychological. One method of partly alleviating them is to have operating samples on hand, ready for the moment that times become favorable.—Electronics, Sept, p66

Densified-Wood Patterns

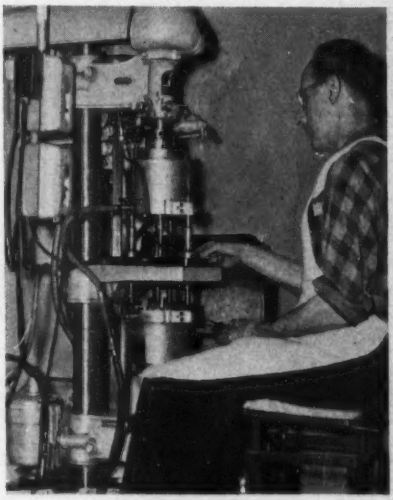
Three years of experience in making 500 foundry patterns of densified wood has meant savings in pattern costs up to 50% for Union Gear & Machine Co. This material, made by Sag-U-Mat Co. of highly compressed, resin-impregnated veneers, is harder than solid wood, lighter than metal, resistant to abrasion and scuffing, and easily machinable.

In building a pattern, the first step is to select stock of proper dimensions. If sections heavier than 2 in. are required, the desired thickness is built up from sanded stock by using a resorcinol resin adhesive. No special care in selecting stock is necessary as the material is uniform throughout.

As in ordinary practice, lines are scribed on the stock to desired outlines, which are then cut on a bandsaw. The densified wood can readily be drilled, tapped, and turned. Surface speeds up to 3,000 sfpm. are recommended. Resulting surface is smooth, hard, can be buffed to a high gloss.—Foundry, Aug, p152

16-Passenger School Bus

Small Metro-bodied coaches and school buses designed to seat 16 children or 12 adults have been introduced by International Harvester Truck Div. Wheelbase is short—113 in.; overall width is 81 in. In the adult coach model, seating can be varied to seat from 8–12 adults. Coaches are designed for airport, resort, bus feederline, and sightseeing uses.—Bus Trans, Aug, p134



TWO-SIDE DRILLING

Top and bottom edges of blanked and pierced holes in steel plates are countersunk simultaneously at International Business Machines Corp. by linked gearless drill-heads on Delta drillpress. Both upright and inverted heads are on same column. Simple notched fixture locates each part.—Am Mach, Sept 5, p97

Modifying Gear Designs For Wear from Heavy Loads

Signs of distress frequently appear on tooth faces when gears are operated under severe torque loads. Under moderate loads, these gears will operate for long periods with no measurable wear. As loads are increased, the first signs of wear occur at the first point of contact. A further load increase often causes a second region of wear to begin at the last point of contact. Very sensitive machines or trained eyes are the only means of determining this wear.

To prevent wearing at these points, gear teeth may be modified. Here is the recommended procedure for modification.

1. Determine accurately the defection curve of a pair of teeth.

2. Modify tip of driven gear tooth or root of the driving pinion tooth so that little or no load is carried at the first point of contact.

3. Modify pinion tip or gear root so that a high load is not carried at different points of contact.

4. Make shape of modification such that reasonably uniform angular velocity is obtained at the most critical operating load.

5. Make tests to see if original modifications should be increased or decreased. —Prod Eng, Sept, p126

Old Mine Shaft Saves Money

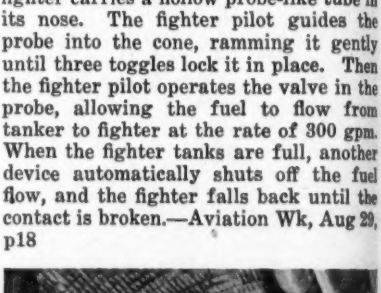
Utilization of an old mine shaft at Consolidated Coal Co. for a gravity sand chute has eliminated handling and cut labor costs. Sand drying is no longer necessary, as predried sand can now be bought in 50-ton loads and stored until needed.

The old hoisting shaft, 54 ft. deep and within 50 ft. of the present tipple, is equipped with a vibrating screen and a 70-ton sand-storage bin. Sand is delivered at the top of the shaft and dumped from railroad cars into an undertrack dump hopper. It then passes through a vibrating screen into the storage bin. The bin opens through a discharge spout at its bottom 9 ft. above the track at the main bottom of the mine.—Coal Age, Sept, p90

Refueling Jet Fighters

A Gloster *Meteor* has been successfully refueled 10 times during a continuous 12 hour flight over England. A total of 2,500 gal. was transferred throughout the constant periods which lasted between 1½ and 2 minutes.

Tanker plane trails a flexible rubber hose fitted with a metal cone, while the fighter carries a hollow probe-like tube in its nose. The fighter pilot guides the probe into the cone, ramming it gently until three toggles lock it in place. Then the fighter pilot operates the valve in the probe, allowing the fuel to flow from tanker to fighter at the rate of 300 gpm. When the fighter tanks are full, another device automatically shuts off the fuel flow, and the fighter falls back until the contact is broken.—Aviation Wk, Aug 29, p18



RAISES FURNACE EFFICIENCY

Interior of malleablizing furnace shows arrangement of newly developed O-tube radiant heaters. Made by Lee Wilson Engrg. Co., Inc., O-tubes have entire heating area inside furnace, thus saving fuel and increasing heating effect. Heating rate is increased by combining secondary air with primary air and gas in the burner.—Steel, Aug 29, p84

World Synthetic Output Rises

World production up despite marked drop in U. S. output of rayon. Rayon runs second only to cotton in total pounds used today

EQUALIZATION between supply and demand for synthetics was reached in the U. S. this year. Although there has been a dip in U. S. rayon production, output of the non-cellulosic synthetics has continued to rise. As shown by the graph, the total world production of rayon continues to rise steadily, because the other countries have not dipped in their rayon production. Rayon is second only to cotton in pounds produced, with high-tenacity yarns in the greatest demand.

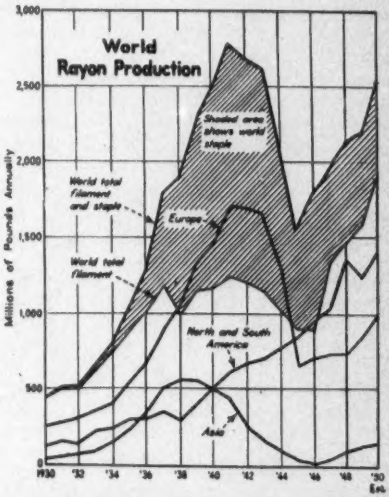
The dominant fibers continue to be viscose and acetate rayon (viscose and estron). More commercial uses are constantly being found for these as well as for nylon, Orlon, the Vinyons, glass fibers, and monofilament yarns (saran and polyethylene).

Polyethylene, produced by American Viscose Corp., is a new yarn. Its cost per pound is higher than saran, but it weighs less and thus balances the price. Tensile strength of this yarn is greater than that of saran, but elongation of the fiber is also greater. It absorbs less than 0.01% moisture, and has 90 to 95% elastic recovery.

At 165° F., the fiber shrinks about 5% and melts at 220°. This shrinkage has been studied by Reeves Bros. who have developed a heat stabilization process which improves the resistance to shrinkage.

Age and sunlight affect the fiber slightly, and it is resistant to acids, alkalies, and other inorganic chemicals. Chlorinated hydrocarbons, aromatics, and aliphatics cause the fiber to swell and become soluble at 160° F. It is insoluble at elevated temperatures in aliphatic alcohols, glycerine, ether, carbon disulphide, and acetone. Pigment is added before extrusion.

The product is manufactured by polymerizing ethylene at high pressures into the polyethylene resin, extruding it into filaments, and orienting by cold drawing and annealing.



A new stable Vinyon N, a nylon competitor, has higher tensile strength in the stretched form than in the stabilized form, but the stabilized fiber stretches far more. The water absorbency of both fibers is close to 1% at 95% relative humidity. Neither type will support combustion, but the stretched fiber shrinks above 157° F. and fuses at 338° F. while the stabilized fiber shrinks at 275° F.

In prolonged exposure to the sun, the fiber darkens somewhat, while age has no effect upon the appearance. Acids and alkalies are resisted by the fiber but ferric chlorine weakens it. Phenol also weakens Vinyon N while certain ketones soften it.

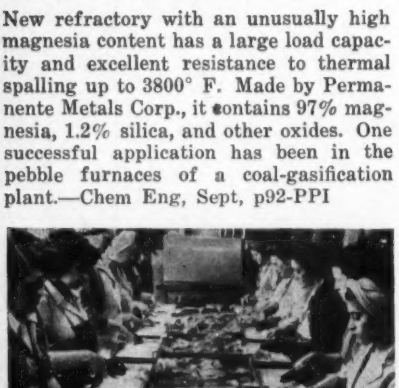
The yarn is produced from a copolymer

of vinyl chloride and acrylonitrile, dissolved in acetone. The product is filtered and dry spun by means of extrusion. The yarn is then stretched and twisted; the stabilized type is dimension set.

Another new fiber is Orlon (see McG-H Digest, Nov '48, p29). The azlon fibers now have an entirely new derivation. Originally a casien product, the prolamine fraction of corn protein (zien) is denatured and dissolved in caustic. The solution is extruded into a precipitating bath, and the resulting tow is after-treated before being cut into staple.—Textile World, Sept, p111

High-Strength Refractory

New refractory with an unusually high magnesia content has a large load capacity and excellent resistance to thermal spalling up to 3800° F. Made by Permanente Metals Corp., it contains 97% magnesia, 1.2% silica, and other oxides. One successful application has been in the pebble furnaces of a coal-gasification plant.—Chem Eng, Sept, p92-PPI



PLASTIC TABLES RAISE FISH OUTPUT

Fish fillets coming from the scaling and cutting operations are trimmed of bruises, fins, and tails on illuminated Lucite candling tables. These new tables step up production by making all the parts to be cut visible. Trimmed fillets then go to briner and packager.—Food Ind, Sept, p101

Preventing Subsoil Rebound In Laying Mat Foundations

Making new floor levels jibe with those of an existing building is an exacting problem. It becomes even more difficult if both original structure and its addition have mat foundations on compressible soil.

This problem was solved in building an all-welded telephone building extension. A 110x93-ft. concrete mat was poured in sections from the center of excavations outward. Digging was kept ahead of the concrete forming and pouring so that subgrade load remained nearly uniform throughout mat construction. Effectiveness of the method was checked constantly by a system of elevation reference points.

The mat had to be constructed in sections because of a stratum of compressible material below the foundations. Analysis indicated that if the subgrade were exposed all at once by excavation, the compressible stratum would rebound as a result of load removal. Settlement would then continue until long after the building was completed. — Eng News-Record, Sept 8, p25

Street Lighting Economy

A study of street-lighting costs has been made by the Montana Power Co. It shows that, in use of incandesent lamps, the series system is more economical than the multiple system.

On series systems, the 6.6-amp. system has certain advantages in the lower ratings. In the 10,000- and 15,000- lumen range, the 20-amp. system is considered to be superior.

The single-wire series circuit, compared with the two-wire multiple circuit, is not only more economical, but also has appearance and construction advantages. In areas with large shade trees, a single wire is easier to erect and maintain.—Elec West, Aug, p66

System Controls Production by Gantt-Type Board

Close production control in a job shop is effected by a simple scheduling method that visually summarizes machine loads. In the Apparatus Div. of Union Carbide & Carbon Corp., 500 types of parts per month are produced in mixed long and short runs with this system.

Heart of the system is a scheduling group that follows through operations at a Gantt-type central planning board. At the start, move tickets—showing labor, machines, and material needed for each part—are made.

Each day the schedule group keeps track of the parts on the planning board with colored tape. As parts move, labor and machines are scheduled on the board from the move ticket, and the position of the tape is changed.

Results from use of the system are: (1) current and accurate information for production control; (2) centralized production planning; (3) elimination of "break-up" of long runs; (4) substantial increase in production.—Factory, Sept, p89

Remote Control of Boilers

Successful operation of television has caused the installation of 10 television cameras on five new boilers in the American Gas and Electric system.

One unit on each boiler views the water level while the other reproduces the six oil-burner flames. The water-level indicator is televised directly. The six flames are reflected by mirrors to two master mirrors. This reflected image is then recorded by the television cameras.

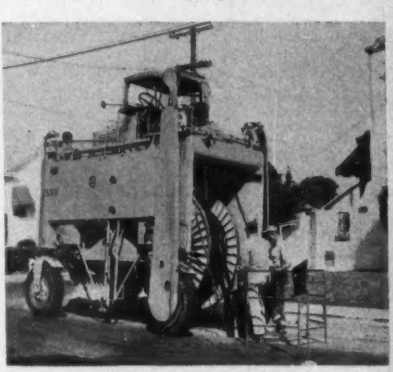
Signals are transmitted over coaxial cable to the monitor-receiver, enabling the operator to control water level, oil lighters, and coal burners, from a central location.

The cost of the industrial installation is eight to ten times greater than that of a home television. Cost-saving analyses have not yet been made, but elimination of manpower and increased safety should make it pay.—Power, Sept, p120

New Nylon Developments

A new resin size, Tyze, for slashing continuous-filament nylon warps, is a white, free-flowing, essentially dustless powder. It is said to be water soluble, easy to apply and remove, and to form a tough, flexible, strongly adhering, non-flaking film. Tyze solutions are acid (pH 3.8 to 4.0) but in the dry state it has proved so far to be non-corrosive to weaving equipment. It was developed by E. I. du Pont de Nemours & Co., Inc.

De Cetex 104, a development of Dow Corning Corp., is a new silicone product designed to give durable water repelling quality to nylon and cellulose acetate (Estron) fibers. The new, easily-applied, low-cost finish is said to be resistant to oxidation, soaps, dry cleaning. —Textile World, Sept, p270, 280



UNDERGROUND CABLE WORK

Straddle truck has been adapted by Pacific Telephone & Telegraph Co. to underground cable construction work. Cable reels are carried on spindles fitting into saddles bolted to truck's load tray. A winch is mounted between reels. Easy maneuverability makes truck ideal for working around manholes and pulling cable.—Elec West, Aug, p63

Technical Shorts

Carbon Monoxide Neutralizer—Large volumes of air in tunnels can be cleaned by placing a new powder containing active silver permanganate in the ventilating systems. The powder is not affected by moisture, and has proved extremely effective when CO concentrations are low. This air-cleaning method is used by Canadian Defense Research Board.—Cons Meth & Equip, Sept, p75

Over-design for Corrosion—Costs can be reduced appreciably by using adequate corrosion protection rather than over-designing for corrosion. Economic advantages of replacing iron by corrosion-resistant alloys, however, are not always realized. In the future, this point is certain to be given greater consideration by design engineers. —Prod Eng, Sept, p153

Ice Cuts Vegetable Loss—Spoilage costs vegetable retailers from 5-6% daily. To reduce this figure, produce men are keeping vegetables moist and iced from the time they are harvested until sold to the customer at the store. Icing keeps corn flavor loss to 3.5% instead of 50% in the first day.—Business Wk, Sept 10, p78

SUPPORTS CYLINDER FOR WELDING

This adjustable roller support, made with four ball-bearing casters and scraps of lumber, handles cylindrical objects to be soldered. It supports work of various sizes. Objects that must be rotated for soldering or welding are easily handled on the rollers.—Factory, Sept, p140

Mine Services Integrated—The Tiger mine of Hume-Sinclair Coal Mining Co. has all the service departments—shop, garage, and supply warehouse—located as a unit at one place. This layout streamlines repair jobs and permits a perpetual inventory system to be utilized. Duties of each department are clearly defined to prevent overlapping.—Coal Age, Sept, p84

Still In Its Infancy—Production men claim that carbide tooling has only begun its development. Cutting speeds are doubling, and more, as better tools and machines are made. Even threading is being done at almost 400 sfpm. And the higher speeds are giving better finish and concentricity. —Am Mach, Aug 25, p127

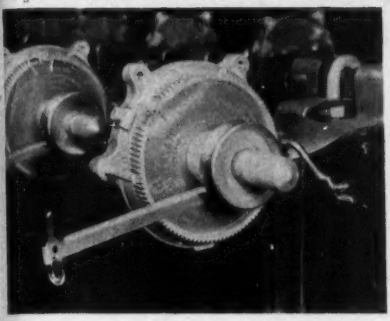
Better Tobacco, More Profit—U. S. tobacco growers are adding value to their crop by use of electricity. Fluorescent lighting aids tobacco grading, and plants are being improved and made disease-free by electric soil heating and sterilization in central plant beds.—Elec World, Aug 27, p118

Heavy Nickel Clad—Plating Engrg. Co. uses a method called electro-nickel cladding, which produces a nickel surface as heavy as that normally obtained by rolled cladding. The coating machines readily.—Steel, Sept 19, p71

Corrosion Note—Researchers at Kure Beach corrosion-testing station report that cathodic protection will cut down salt-water corrosion of pipes if the salt water is flowing outside the tubes and if the zinc is pure. When salt water is inside tubes, results are poor as current does not penetrate into the tubes.—Power, Sept, p105

Swiveled Bus Seats—New York Transit System is testing swiveling seat for city buses. Seat backs and cushions are staggered to give extra shoulder room. Aisle-cushion pivots to permit easier exit of passenger sitting on the outside.—Bus Trans, Sept, p247

Gas Turbine Tryout—Westinghouse 2,000-hp. gas-turbine unit (see McG-H Digest, June, p53) has been installed temporarily on a natural-gas transmission line to determine its usefulness for such work. Direct connected to it is a centrifugal-type gas booster.—Oil & Gas J, Aug 25, p115



CUTTING RAYON YARN STRETCHING

Frick and Eaton mills at Patterson, N. J. have reduced spoilage of synthetic yarns to less than one percent along with a speed up of production and elimination of shiners in rayon and taffeta fabrics. These ball bearing twin-disk compensator sets the tension constant regardless of changes in the yarn.—Textile World, Sept, p278

Lightweight Drill Wagon — Particularly useful for drilling benches developed in the contour mining system used underground at Pend Orville Co. is a wagon consisting of two elbow-shaped pipes, two wheels, and a cross bar. Unit can be employed for drilling toe, horizontal, and inclined holes. A single drifter is mounted on the cross-bar.—Eng & Min J, Sept, p110

Mass Producing Plastic Boats—Glass-fiber mats impregnated with polyester resin are being used to make small molded boats by the Beetle Boat Co. Boats are inexpensive and produced at a rate of 15 per day. One variation from other methods is that a male instead of a female mold is used.—Mod Plastics, Sept, p103

Increases Diesel Power—Most popular way to increase diesel-engine output in past 15 yr. without increasing engine size or crankshaft speed has been super charging. Supplying more air above atmosphere pressure means burning more fuel, making more power.—Oper Eng, Sept, p43

Ceramic Cutting Tools—A patent has been granted in England on lathe tools made of sintered ceramic materials. They are made by pressing calcined aluminum-oxide powder into suitable shapes and firing at 1550-1750° C. for 7-10 hr. No bonding agent is needed. Final product can be ground and lapped.—Mach, Sept 17, p766

Trains Pilots Cheaply—Pan American Airways uses an electronics flight simulator to train "Stratocruiser" pilots. Cost is nearly as much as a twin-engine plane but savings more than make up the cost. Training flights in a "Stratocruiser" would cost nearly $1,000 and a mistake in flight might result in the loss of a $1,500,000 plane. Cost of operating the simulator is $50 per hr.—Aviation Wk, Sept 19, p37

Freezing Eggs in Shells—Eggs may be frozen without breaking the shells if: (1) they are partially dehydrated, (2) volume of the white has decreased to allow expansion of the yolk, (3) they are frozen under vacuum. Stored for 6 months at 24° F., eggs thus treated had a 10% survival of embryos. After thawing, the eggs rot rapidly.—Food Ind, Sept, p62

Cleans Monorail — Gibson-Refrigerator Co. has mounted a brush behind one part-carrier roller to brush dirt off monorail. Carrier immediately below brush is always empty. Cleaner rails have resulted in less rework, fewer defects, and less scrap.—Ceramic Ind, Sept, p56

Turns to Permanent Molding—A British foundry making paraboloid-shaped aluminum castings 36 in. in dia., 27 in. long, and of ¼-in. wall thickness switched from sand to permanent mold casting. Advantages: increased production, lower cleaning cost, smoother surface, no risk of distortion.—Foundry, Sept, p132

Powers Rockets—Nitromethane is now under test as a rocket-engine fuel. Safe at ordinary temperatures, it explodes at 500° F. into hot mixture of nitrogen, hydrogen, carbon monoxide, carbon dioxide, and steam. A catalyst produces a smooth, continuous explosion.—Chem Eng, Sept, p74

Hot Handler — Special-rubber conveyor belt, made by B. F. Goodrich Co., handles hot (220-240° F.) loads of chromite clinkers at basic brick plant of Permanente Metals Corp. Still in service after 6 months duty, it will far outlast previous belts which had to be replaced every 2 months. —Steel, Aug 29, p59

FREE SERVICE TO READERS

As a special service to our subscribers, McGraw-Hill Digest will furnish, without any charge, additional information about any new product or technical development described. Address your letters to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A. —*THE EDITORS*

Powder Metallurgy Production

If your plant makes small metal parts or buys them outside, a change to powdered metal may mean sizable savings in labor, material

POWDERED METALS, compared with most materials, are economical. Iron powder, for instance, is today the cheapest small-parts construction material. Other advantages include a wide range of physical properties and little scrap in processing.

Powder metallurgy is particularly suited to mass production. But even quantities of a few hundred pieces for short production runs can be made economically if tooling costs are not too high.

The method has long been applied to such products as porous bearings, contacts, electrodes, cutting tools. Designers today, however, are making pressed and sintered structural parts that up to now have been made by die-casting, screw machining, stamping, or other conventional methods.

Design Procedure—The first step in deciding whether to make a part out of powdered metal is to plan and sketch a tool to produce the part. It must be determined if the required physical properties are attainable—not in test bars, but in the part itself. Use of temporary tools to make a trial product often prevents scrapping of an expensive production tool. Powder-metal tools, unlike other process tools, cannot readily be altered.

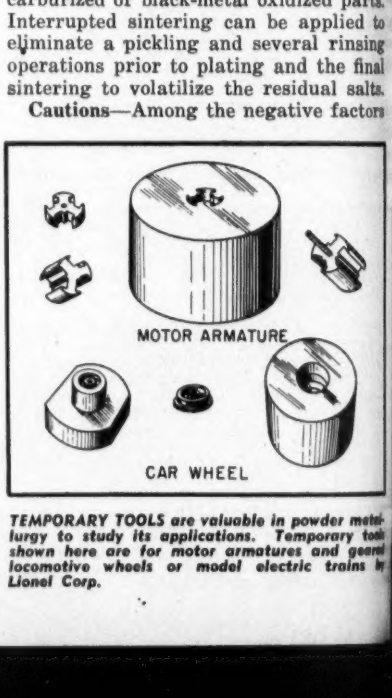
Temporary tooling and experimental procedure should be performed within the plant, because experimental work should be undertaken under supervision of the development engineer. No custom fabricator, however cooperative, can be expected to engage in numerous experimental projects of this nature.

In-Plant Powder Metallurgy—Before in-plant powder-metallurgy production is considered, it should be determined whether the value of special powder-metal parts used in the product is sufficient to maintain a complete manufacturing unit working with a high load factor.

Besides the normal manufacturing profits, other advantages of in-plant powder metallurgy are savings in transportation, crating, handling, close inventory and production controls, and freedom to make changes in design to facilitate manufacture or to improve product.

When other processes, such as hardening, annealing, and plating, are required in the manufacture of a product, they often can be combined with fabrication of powdered-metal parts. This may provide economy in handling. Such economy occurs, for example, in processing gas-carburized or black-metal oxidized parts. Interrupted sintering can be applied to eliminate a pickling and several rinsing operations prior to plating and the final sintering to volatilize the residual salts.

Cautions—Among the negative factors



***TEMPORARY TOOLS** are valuable in powder metallurgy to study its applications. Temporary tools shown here are for motor armatures and gears for locomotive wheels or model electric trains by Lionel Corp.*

be weighed in the establishment of powder-metallurgy department is the relative scarcity of experienced supervisory personnel trained in the field.

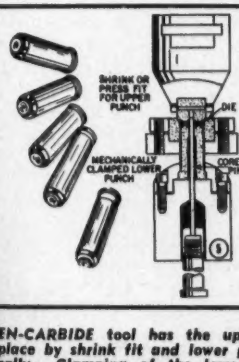
The sad experience of a number of manufacturers has shown that in-plant powder metallurgy should never be undertaken unless the manufacturer has a small, well-equipped toolroom to maintain, replace, and repair broken or worn parts on tools or pressing machinery.

Maintenance on powder machinery is among the highest of all manufacturing processes. This factor should be kept in mind when estimating the cost of in-plant versus custom fabricated parts.

Tooling for Powder Machinery—Tooling seldom presents a problem with single-pressed pieces requiring single punches at the top and bottom.

Tool material is determined by the length of run. Over 250,000 iron parts can be produced on an average from tool-steel dies before repair or replacement is necessary. A special characteristic of powder-metal tools is that any excessive wear becomes quickly apparent by visual inspection of the piece itself.

When production runs into millions of pieces, tungsten-carbide dies will more than pay for themselves. Careful attention must be given to the method of handling the carbide facing or tip to the tool-steel shanks. The high compacting pressures will at times break down an apparently perfectly brazed joint. Best results have been achieved by eliminating brazing entirely and retaining tungsten-carbide facings within the steel shank by shrink or press fit.



TUNGSTEN-CARBIDE tool has the upper punch held in place by shrink fit and lower punch held mechanically. Clamping of the lower punch is still in the experimental stage.

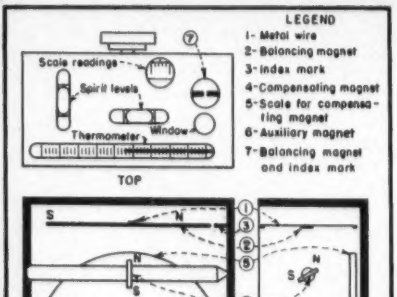
Complex Parts—The process is so new that few engineers agree on any one method of tool construction. Complex pieces can usually be pressed in temporary tools by alternate shimming and pressing of the separate punches. But production tools frequently present a problem too complex for the average tool designer.

Intricate parts are usually made, and properly so, on multiple-ram machines. These machines, costing $25,000 and up, are found at custom fabricators. The cost seldom justifies in-plant production of complicated metal-powder parts. Complex metal-powder tools require a much greater lead time than conventional material tools. The reason is partly because the powdered parts lack plastic flow; this necessitates much more experimental tool adjustment.

Expanding the Field—Research now in progress may open even greater opportunities for powder metallurgy. One such opportunity is the pressing of magnetic structures operable at high flux densities at commercial power frequencies. Considerable success has attended the use of sintered parts for d-c. motors. A-c. applications have not as yet been achieved.

Aluminum Powders — Aluminum is hard to press and relatively easy to cast. So powdered aluminum development has been slow. But methods lately devised may afford cheap production techniques. Aluminum pressed parts are desirable because an elaborately flat finish can be obtained.

Applications may include decorative uses, low-friction bearings (to save copper), and lightweight structural parts—especially in aviation equipment.—Steel, Aug 22, p68



PORTABLE magnetometer makes possible . . .

Rapid Magnetic Surveys

Under favorable conditions with stations 30 ft. apart, as many as 60 observations per hour can be made with a magnetic survey instrument. A new design contributes to this speed by making it unnecessary to orient the unit or arrest working parts when moving. The instrument has an accuracy of 2 to 3 gamma when careful observations are made.

A delicately suspended balancing magnet is moved from its zero position by any change in the vertical component of the earth's field from one observation point to another. The amount of adjustment of a compensating magnet to bring the balancing magnet back to zero is then read directly from the attached dial. Readings can be converted to gammas by calibration with a Helmholz coil.

The instrument measuring the vertical component of the earth's field is best adapted for the northern latitudes. However, the principle may be used in other latitudes.—Eng & Min J, Sept, p114

Silicone Coatings on Bakery Pans Reduce Labor and Cost

Silicone coatings for bakery pans save labor and materials used in greasing and reduce haze that is common with grease-coated pans. Coatings are good for 100 to 200 bakings per application. Instructions of the manufacturer must be followed for best results. Also, shop conditions, formulas, and schedules may require slight changes.

Briefly the recommended procedure for their use is: (1) burn out new pans, (2) straighten dents in pans, (3) clean, rinse, and dry pans, (4) dip or spray pans with coating in a well-ventilated place away from flames, (5) drain off excess coatings, (6) air-dry pans inverted for several hours, (7) cure pan in a tray oven at 425° F. for at least 4 hr., (8) allow pans to cool, not nested.

Careless handling of pans may adversely affect free release of baked goods. Glass-like coated surfaces should not be chipped or cracked, and doughs should not contain too much sugar or syrup.—Food Ind, Sept, p73

Vinyl Solves Welting Problems

Welting, the narrow strip to which both the upper and the sole of shoes are joined, has posed a perennial problem to the trade. Leather is generally used, but it lacks uniformity and often is not long enough.

The Okonite Co. is now producing a plastic welting, called Dryseal, that solves both these problems. With the plastic welting, a tighter seam results because Dryseal retains its dimensional stability. It is extremely resistant to the action of oils, acids, and alkalis. Temperature conditions as low as —20° F. do not affect its flexibility. The manufacturer also reports that this vinyl resin-base welting has superior wearing and waterproof qualities.—Mod Plastics, Sept, p81

Automatic Hard-Facing With High-Alloy Wires

Development of high-alloy wires has enlarged the field of automatic welding to include hard-facing. The automatic application is readily adapted to any equipment on which hard-facing may be laid in a series of continuous stringer beads. Most automatic electric heads now on the market will handle the tubular hard-facing wires, or can be adapted by minor changes.

One group of hard-facing wires is made with alloy contents varying between 5 and 10%. Hardness ranges from 35 to 55 Rockwell C. Another group of wires has a 10-35% alloy content. These can be made with high-carbon content to provide abrasion resistance or with alloys to provide heat and corrosion resistance.

Automatic hard-facing was first used for rebuilding tractor rollers. These can be rebuilt to full size for usually one-half the cost of replacement parts. When thus rebuilt, roller life is claimed to be two to four times the life of factory replacement parts.—Welding Eng, Sept, p44

Vacuum Fumigation Kills

The U. S. Army Quartermaster Corps has found vacuum fumigation the best method for controlling insect pests in stored foods. Dried foods, which are highly susceptible to infestation by insects when stored in warm places, are now adequately protected.

Commodities to be fumigated are brought into an airtight chamber and left packed. The chamber is kept over 75° F. because susceptibility of insects to gases increases with temperature rises. A high vacuum is drawn, and a lethal gas introduced. The gas rapidly and completely destroys the insects in all stages of development. Chamber is then exhausted and flushed with fresh air.

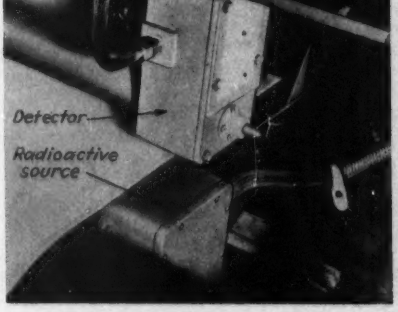
To date, the most effective gases for this work have been methyl bromide and acrylon. Different dosages are used for different kinds of foods. But, regardless of the type of commodity being processed, a fumigation cycle lasts about 4 hours.—Food Ind, Sept, p80

Machine Speeds Veneering

Greater speed and efficiency in edge-gluing of thin wood strips or veneers are possible with an electronic veneering machine. Developed for Anacortes Veneer, Inc., it makes use of the Mann-Russell parallel bonding principle to heat-cure resin-coated wood surfaces at relatively low pressures.

Use of the machine eliminates a 3-4% ratio of waste materials. It operates as rapidly as heated-drum veneering units without demonstrating their splicing difficulties.

Although the machine is being used primarily for production of clear face stock, it is also adaptable to the production of core stock from waste wood materials.—Electronics, Sept, p140



ISOTOPES MEASURE THICKNESSES

Strontium-90 isotopes are used by this Beta gage to determine thickness of box board. Sheet of material to be measured, interposed between source of radiation and detector, absorbs radiation in proportion to its weight per unit area. Weight or thickness is read on calibrated recorder.—Prod Eng, Sept, p158

How to Prevent CO Hazards In Various Mine Areas

Many fatalities in all kinds of mines are due to complacent attitudes toward carbon monoxide. Small concentrations of it can cause headaches, unconsciousness, or death. Produced by blasting, burning fuse, and underground fires, it collects in tops of raises or high points in stopes.

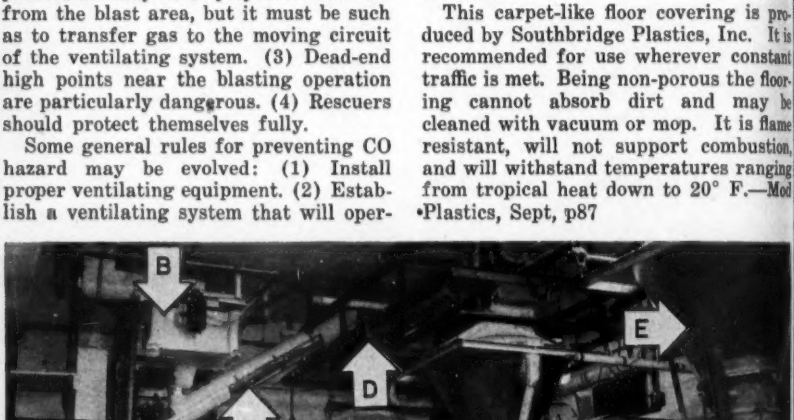
A study of many cases of gassing has produced the following information. (1) Safety from CO is not assured by providing a route for air to flow through or near the blasting face. (2) A jet of compressed air may be employed to clear CO from the blast area, but it must be such as to transfer gas to the moving circuit of the ventilating system. (3) Dead-end high points near the blasting operation are particularly dangerous. (4) Rescuers should protect themselves fully.

Some general rules for preventing CO hazard may be evolved: (1) Install proper ventilating equipment. (2) Establish a ventilating system that will operate units in dead-end areas. (3) Use a suitable air and water spray. (4) Educate labor and supervision on CO and first-aid. (5) Have suitable masks handy. (6) Do not rely entirely on compressed air to clear CO from dead-end working place.—Eng & Min J, Sept, p76

Plastic Cover Like a Carpet

Vinatred vinyl carpeting is made by deep-embossed calendering of clear Geon vinyl chloride over colored or printed fabric. The new carpeting is laid over $\frac{3}{16}$- or $\frac{1}{4}$-in. sponge rubber and is available in thicknesses of 0.070, 0.050, and 0.040 in.

This carpet-like floor covering is produced by Southbridge Plastics, Inc. It is recommended for use wherever constant traffic is met. Being non-porous the flooring cannot absorb dirt and may be cleaned with vacuum or mop. It is flame resistant, will not support combustion, and will withstand temperatures ranging from tropical heat down to 20° F.—Mod Plastics, Sept, p87



FLOUR-HANDLING SYSTEM RAISES EFFICIENCY

To reduce work and raise efficiency in flour handling: a bucket elevator (A) takes flour to rotosifter (B) from which screw conveyor (C) carries flour to twin distributing and return conveyor (D). Next, flour is automatically weighed (E) and dropped into high-speed, water-jacketed mixers.—Food Ind, Sept, p70

Dealer's Road Test Track Sells Cars and Service

Installation of a test track at a mid-western Dodge-Plymouth agency has stepped up customer confidence. The agency can prove their claims about their new cars to prospective clients, and accurately discover reasons for mechanical failures in those brought in for repair.

The test area of 5 acres has been built into every type of road found in the surrounding state—curves, straightways, grades, and different kinds of road surfaces. Result is that trouble can be more quickly located than if mechanic drove the car on a smooth city block. Power of new cars in various situations can quickly be demonstrated.

One lane has been set aside for safety checks. Here brakes, lights, wheel alignment, and other factors affecting safety are checked.—Amer Auto, Oct, p38

Sound Waves Wash Clothes

Two Australian inventors have made use of sound waves to wash clothes. Their machine produces a 100-cycle sound wave, which makes the clothes in a tub oscillate, shaking dirt particles loose.

In use, clothes are packed around the sound-wave generator in a tub. The usual amount of soap and hot water is then added, and the vibrator turned on. In most cases, the clothes are washed completely in less than 5 min. Dirt particles are left suspended in the water.—Electronics, Sept, p150

Service to Digest Readers

As an added service to McGraw-Hill Digest readers, the following special reports from other McGraw-Hill publications are made available for purchase. These reports, too long for inclusion in the Digest, will be sent on receipt of one dollar ($1.00) for each report desired. Address Editor, McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A.

WIND-TUNNEL COMPRESSOR

Supersonic wind tunnel at Langley Aeronautical Laboratory has an 870,000-cfm. axial compressor built by Allis-Chalmers Mfg. Co. Believed to be most efficient device ever built for moving air, it weighs 140 tons. Rotor blades, of which tip speed is 560 mph., were final-trimmed in place.—Steel, Sept 5, p60

Bakery Progress and Dairy Progress Today—These two reports (8 and 16 pages) place particular emphasis on the advanced trends in their fields and cover handling, sanitation, processing. Both are sold for the price of one report.—Food Ind, Aug, Sept

High Pressure—This 17-page report on high-pressure techniques treats new applications, new fabricating methods, vessels, reactors, separators, heat exchangers, valves.—Chem Eng, Aug

Mining Looks to the Future—A group of articles, totaling 71 pages, surveys the problems facing the mining industry and tells what is being done today and what lies ahead to be done tomorrow. An important section treats mining's future abroad.—Eng & Min J, July

Planned Lighting Systems—This 24-page report deals with the commercial application of modern lighting technology. It shows how planned lighting efficiently fills the needs of store, office, factory.—Elec C&M, Sept

New Products

Soil Compactor—Unit can be adapted both to compacting soil and to salvaging and maintaining bituminous pavements. Closely spaced high-pressure points on the machine surrounded by confined low-pressure areas result in high degree of compaction with minimum material shifting. The grid roller consists of two 5-ft. dia. wheels attached to a frame.—**Hyster Co.**—Cons Methods & Equip, Sept, p100

High-pressure Cleaner—Providing pressures up to 400 psi., Model 200S Speed Cleaner is designed to simplify cleaning problems. Hot water up to 180° F. and detergents may be used through the unit. It is built to withstand rugged treatment.—**Food Machinery and Chemical Corp.**—Food Ind, Sept, p143

Semiautomatic Contouring—Hydraulically controlled, semiautomatic contouring machine has endless band saw, 20-in. throat, speed range of 40-10,000 fpm. The "Contour-matic" will cut material up to 12 in. thick.—**DoAll Co.**—Steel, Sept 5, p129

Modular Lighting—Any room can be custom-fit with numerous pattern designs by using fluorescent module system. It consists of four modules, or units, of different size and lamp capacities. Equal brightness can be produced on all sides, regardless of pattern.—**Mitchell Mfg. Co.**—Elec World, Aug 27, p122

Clamp and Shear Cuts Yarn Waste—Compactness and simplicity are features of a new clamp and shear mechanism which reduces waste in knitting jersey about 9%. The width of the yarn change lap is cut by ½ inch or more.—**H. Brinton Co.**—Textile World, Sept, p172

Detects Flame Failure—Photoelectric device, Fireye, safeguards oil-burning equipment against flame failure. It can be used with programming controls to protect automatically ignited oil burner.—**Combustion Control Corp.**—Oil & Gas J, Sept 15, p141

Flexible Car Window—Completely flexible car windows can be produced from Vinylite VT 1928, a formulation with extra transparency. The window is particularly suitable for convertible rear windows. It is about 0.040 in. thick and is reported to increase rear vision of convertibles by 500%.—**See-Clear Co.**—Mod Plastics, Sept, p138

ENDLESS HACKSAW CUTS DEEP

Absence of usual hacksaw frame on new endless hacksaw permits deep cuts to be taken. Blade is supported in front casing by three balls and by a slot in tubular member. Forward stroke compresses spring in center tube, making return stroke automatic. The saw is made by Leytonstone Jig & Tool Co. Ltd., Leyton, London.—Machinist, Sept 3, p695

Roof-bolting Stopers—Short stopers RP-4B with either jackhammer or anvil-block frontheads, are used for both drilling holes and driving pins. They are equipped with release rotation so pins can be driven without turning. Stopers are available with various lengths of feed.—**Ingersoll-Rand Co.**—Coal Age, Sept, p110

Protects Hoists, Cranes—The Dyna-switch, designed to protect hoists and cranes from accidental overloads, slips onto crane hook. Load is directly beneath it. Overload causes circuit to open, cutting out motor.—**W.C. Dillon & Co.**—Elec C & M, Sept, p165

Bends Tubes—Model 848 manually operated tube bender handles tubing to 3 in. in copper, aluminum alloys, and light- or medium-gage steel. Bends to 180° can be made in radii of 1¼-12 in.—**Parker Appliance Co.**—Oper Eng, Sept, p82

Tractor Weighs 518 lb.—Small acreage farmers can successfully use the Tiger 3, a low priced, four-wheel tractor. It features an all chain drive, a gear shift, reverse gear, and brakes. Gasoline consumption is 2 gal. per 8 hr. of operation.—**Indexco Corp.**—Amer Auto, Oct, p47

PLASTIC CAR MADE IN MOLDS

Plastic body with standard mechanical components are featured by this small car projected by Del Mar Motors, Inc. Some production is already under way. It has a 63-hp. 4-cylinder engine, hydraulic brakes, and 600/12 tires. Wheelbase is 100 in., ground clearance 8 in., and front seat space 60 in.—Amer Auto, Oct, p62

Heavy-duty Pumps—Designed to handle non-lubricating liquids, Tri-Rotor pumps are available in sizes of 2, 2½, and 3 in. for capacities of 80-100 gpm. They can be equipped with solid, bypass or variable-volume-control type heads to meet wide variety of requirements.—**Yale & Towne Mfg. Co.**—Chem Eng, Sept, p152

Loom Operates More Smoothly—Integrally mounted loom flywheel reduced variations of speed and current thus reducing both power losses and power consumption. It often provides higher speeds without increased hp. rating.—**Small & Medium Motor Div., General Electric Co.**—Textile World, Sept, p168

A-C. Welder—The 'Fleetwelder 200' is a new 200-amp. industrial type welder with reserve capacity over its 250-amp. max. Booster helps start arc automatically; electrode capacity is 5/64 to ¼ in. There are no moving coils or leads in the winding.—**The Lincoln Electric Co.**—Welding Eng, Sept, p54

Saran-lined Filters—Filters Series SLA are constructed of Saran-lined pipes and fittings and rubber-lined filter and precoat tank. Units are satisfactory for filtration of corrosive liquids, at temperatures of 0-180° F. Linings exhibit excellent insulating properties and resistance to erosion and abrasion.—**Titeflex, Inc.**—Food Ind, Sept, p146

Gear Shaving Machine—External transmission gears, regardless of size and including cluster and stem and timing gears, are shaved automatically by a new gear shaver. The machine, Model GCU diagonal gear shaver, runs continuously as long as the magazine is kept filled, and is equipped with an automatic loader.—**National Broach & Machine Co.**—Iron Age, Sept 8, p40

Right- or Left-hand Faucet—New faucet insert eliminates threading systems for right- and left-hand faucets. When faucet is turned on, hole in rubber sleeve matches hole in brass collar, allowing water to pass. Fiber washer at sleeve base serves as faucet gasket.—**Simplex Faucet Co.**—Hardware Age, Sept 8, p192

Absorption Machine—New industrial refrigeration machine employs either high- or low-pressure steam in a generator tank to boil off water vapor absorbed in a refrigerant absorber. The system uses a salt-water solution as a refrigerant.—**Carrier Corp.**—Power, Sept, p154

Rolls Paint On—Flo-matic roller rolls paint on flat surfaces, eliminating stopping to dip brush. Tubular handle holds over half pint of paint under pressure. Opening valve permits paint to flow to 4-in. roller. —**Rubberset Co.**—Am Builder, Sept, p152

Magnetic Tape Splicer—The MT-1 Presto-Splicer permits splicing of ¼-in. magnetic recording tape without scraping, cementing, use of adhesives, or loss of tape material. It produces, a plastic weld. Equipment is self-timing and operates on 115v., 50 or 60 cycle ac. with automatic line compensation.—**Prestoseal Mfg. Corp.**—Electronics, Sept, p126

Planetary Winch—General-purpose winch has planetary-gear mechanism within 4-in. dia. winch drum. Direct cable pull is 600 lb. Brake action is positive.—**Lewis-Shepard Products, Inc.**—Oper Eng, Sept, p74

Threads, Trims—No. 302 threading and trimming machine also beads, knurls, and curls, either separately or in combinations. Feed is automatic. Threading rate is 35 per minute.—**V & O Press Co.**—Steel, Sept 12, p164

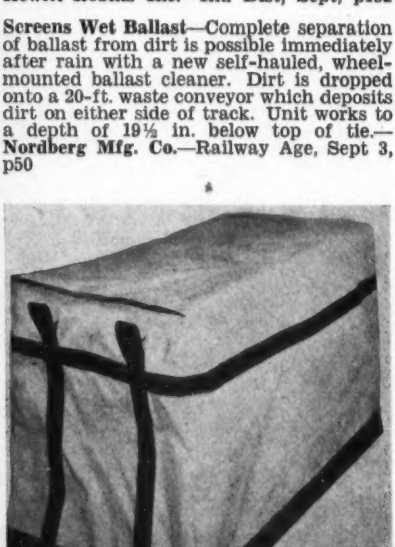
Slimline Luminaire—Fluorescent light fixture, the "Merchandiser," carries four 8-ft. slimline lamps. It has one-piece housing and features instant start starterless operation.—**Westinghouse Electric Corp.**—Elec C & M, Sept, p163

New Products (Cont.)

Automatic Gear Loading — Automatic loader on No. 2 bevel and hypoid-gear generators raises efficiency to 95% from 80% for manual loading. Loading time per cycle on blanks ¼-1½ in. in dia. is 5 sec. Device can be installed on old machines or specified on new.—**Gleason Works.**—Am Mach, Aug 25, p130

Rotary Wire Brush—Steel bristles set in rubber constitute a rotary wire brush designed for use on bench or portable tools for buffing, roughing, or finishing. It is available in sizes of 6, 8, and 10 in.—**Hewitt-Robins Inc.**—Ind Dist, Sept, p132

Screens Wet Ballast—Complete separation of ballast from dirt is possible immediately after rain with a new self-hauled, wheel-mounted ballast cleaner. Dirt is dropped onto a 20-ft. waste conveyor which deposits dirt on either side of track. Unit works to a depth of 19½ in. below top of tie.—**Nordberg Mfg. Co.**—Railway Age, Sept 3, p50



COLLAPSIBLE CARGO CONTAINER

Cargo planes can be loaded in 15-20 min. with this collapsible cargo container, according to Air Associates, Inc. Container is made of reinforced canvas on a plywood base. Web-loop handles are provided on both ends. Loaded, it contains 20 cu. ft. or 450 lb. maximum. It measures 2x4x2½ ft. It collapses into a flat 1½-in. plate weighing 22 lb.—Aviation Wk, July 25, p47

Solderless Terminal Kit—Including a complete assortment of wire terminals, solderless tubing, and a crimping tool, a new terminal kit makes soldering of terminals unnecessary. Plier-like tool fastens terminal securely to wire; it also serves as a cutter and stripper for wire of 10-22 gage.—**Lynn Products Co.**—Fleet Owner, Sept, p89

Deodorizes Exhaust—Automotive exhaust fumes passed through a deodorizing unit lose their obnoxious odor. Catalyst further oxidizes the hot gases and does not deteriorate through use.—**Consolidated Car-Heating Co.**—Bus Trans, Sept, p261

Restart Control—Designed to reclose automatically after temporary power failure, restart control is intended for rural areas with irrigation and oil-well pump motor starters. Units are for 115, 220, or 400 v, 60 c.—**Ward Leonard Electric Co.**—Elec West, Aug, p46

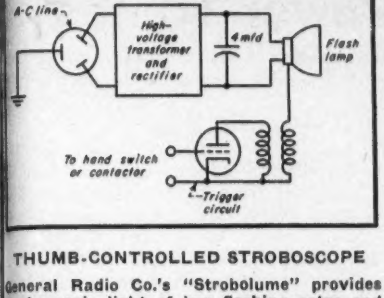
"Magnetic" Adhesive—H-511 Ubabond, a synthetic rubber cement, permits pre-cementing of many materials. Described as "magnetic" in behavior, pre-cemented surfaces can be joined at later time without loss in adhesion efficiency.—**Union Bay State Chemical Co.**—Nucleonics, Sept, p87

Magnetic Brake—Two-shoe, two-magnet dc. brake is designed for use on steel-mill drives, cranes, hoists, bridges, and conveyors. It is available in six sizes, up to 2,700 lb.-ft., and is applicable for right- or left-hand mounting.—**General Electric Co.**—Elec World, Sept 3, p29

Improved Classifier—Employing about 50% fewer moving parts than earlier models, Type H classifier has radically different head-motion design and rake path. Its balanced motion reduces structural stresses and power losses.—**Dorr Co.**—Chem Eng, Sept, p147

Heavy-duty Hand Truck—Motorized hand truck has capacity of 10,000 lb. Driven by two 12-v. motors, it has an open platform well suited to core handling in foundries.—**Moto-Truc Co.**—Foundry, Sept, p232

Movable Pneumatic Vibrator—Weighing 14 lb. and measuring 6¾x4x3½ in., air-operated vibrator is particularly adaptable to installations requiring non-permanent vibration. It is equipped with a rugged milled steel hook that slips into brackets welded or bolted to the item to be vibrated. The unit operates on continuous line pressure of 50-100 psi.—**Cleveland Vibrator Co.**—Iron Age, Sept 1, p119



THUMB-CONTROLLED STROBOSCOPE

General Radio Co.'s "Strobolume" provides stroboscopic light of low flashing rates and high intensity. Continuous-operation speed range of 45 flashes per min. is suited for study of moderate-speed machines. Flash is produced by repeatedly pressing thumb switch which, through spark coil, ionizes gas in flash lamp. This initiates discharge of capacitor, causing lamp to flash. For higher speeds, thumb switch is replaced by vibrator.—Prod Eng, Sept, p101

Testing Machine—A 5,000-lb. capacity universal testing machine, model PTE, tests plastics, fine wires, and light structures. It has hydraulic and pneumatic load cells providing ranges of 5,000, 1,000, 200, and 50 lb. It was also designed for automatic reversal and cycling of loads.—**Baldwin Locomotive Works.**—Mod Plastics, Sept, p134

Vibration Pickup—"Vibratab" is said to be a valuable tool in rocket and missile study, flight testing of aircraft control surfaces, wind-tunnel experimentation, and applications requiring vibration research. It will respond to frequencies from 3 to over 2,000 cps.—**Telecomputing Corp.**—Aviation Wk, Sept 5, p18

Destroys Moths—Electric moth destroyer, the Moth-King, volatizes paradichlorobenzine and shuts off automatically when proper saturated atmosphere is distributed throughout clothes closet. It operates on ac. or dc.—**Moth-King Corp.**—Elec Merch, Sept, p158

Dust Collector Easily Installed—The 'Dustolector' cleans air of grinding dust. The air is drawn from the grinder wheel hood through the air expansion chamber. There the heavier particles drop into the dust pans, and finer particles are removed by fiber glass filters.—**Hammond Machinery Builders.**—Welding Eng, Sept, p47

Chlorinated Hydrocarbons—Properties of Chlorinated Hydrocarbon-70 indicate potential use as a plasticizer and flame retardant, for coating of wood, textile and paper products, and in manufacture of adhesives. It has no flash point or fire point, and is soluble in most alcohols, ketones, and hydrocarbons.—**Pennsylvania Salt Mfg. Co.**—Paper Ind & World, Aug, p624

No Ballast Needed—New fluorescent lamp incorporates in its glass tube a special resistance that eliminates need for external ballast. Sockets are polarized to assure lamps being inserted correctly. Starters are standard.—**Solar Electric Corp.**—Elec Whols, Sept, p115

Fluid-drive Cranes — Overhead traveling cranes have fluid-drive couplings to permit use of inexpensive bridge and trolley motors and to provide a cushion effect. Full-view cab gives lateral vision of 246°. Cranes are magnetic controlled.—**Whiting Corp.**—Foundry, Sept, p223

Cargo Refrigerators — Steel refrigerated enclosures, in 150- and 200-cu. ft. sizes, are equipped with self-contained gasoline-and-electric-driven refrigerating units. Lifting rings and I-beam skids make them portable.—**Refrigeration Engrg. Corp.**—Oil & Gas J, Sept 1, p76

Twin-line Connectors — Requiring no splicing, soldering, or taping, these twin-line connectors accomodate the standard 300-ohm line. They are made from polystrene blocks, drilled to hold stripped ribbon leads. A small set screw maintains contact.—**Products Engineering Co.**—Electronics, Sept, p192

Overloader Adaptable to 'Cats — Any crawler-type tractor can be converted to an overloading unit with a new over-shot loader. Unit adapts track units for mucking, stockpiling, quarrying, or snow removal; fitted with fork it can be used for handling poles, ties, or timber. Bucket sizes are 1½, 2½, and 4 cu. yd.—**John Austin, Inc.**—Eng News-Rec, Aug 25, p69

READER SERVICE

As a special service to our subscribers, McGraw-Hill Digest will furnish, without any charge, additional information about any new product or technical development described. Address your letter to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A. —THE EDITORS

1949 Survey of Power Trends

Present design trends in central-station and industrial installations will guide power-plant engineers designing new or modernized plants

IN SURVEYING over 625 new steam and hydroelectric stations *Power* has found that the greatest period of construction activity in the power field continues unabated. Many designs are involved: new plants, large and small; extensions; indoor, semi-indoor, and outdoor—all with wide varieties of heat-balance arrangements, layouts, and equipment selections.

Most new units in central-station installations are using relatively conservative throttle pressures and temperatures centering around a preferred standard of about 900° F. and 800 psig. According to the capacity distribution figures, higher throttle conditions tend to predominate, reflecting larger turbine size.

Use of one boiler per turbine and of 4 bleed points continues to be popular. Pulverized coal maintains the position of most popular fuel. Hydrogen cooling predominates.

An interesting step is elimination of induced draft fans on 3 oil- and gas-fired installation. Furnaces will be pressurized and induced draft furnished by blowers.

Consolidated Edison Co. of N. Y. in its Hudson Ave. station sets a new record in installing a 1,300,000-lb.-per-hr. steam generator. It will operate at 1,500 psig. and 1050° F. to feed a 6,500-kw. topping turbine.

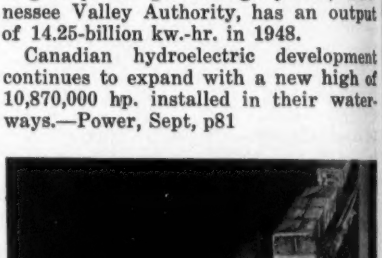
Survey information tends to bear out earlier reports that industrial spending in 1948-49 would be largely for modernization rather than new plants. No single segment of the industry is pushing a large expansion of facilities, as was done last year. Total amount of equipment going into service remains at a high level.

Since oil production has caught up with demand, it is hard to estimate what effect this situation will have on firing equipment. It is worthwhile to notice that many of the pulverized-coal installations are capable of burning oil, either immediately or with slight modifications.

Growing use of dust collectors is connected with the drive to clean up the air. General favor is toward mechanical types. A large percentage of dust collectors are used with spreader stokers.

Waterpower development continues at an accelerated rate with a total of 25,500,000 hp. now in operation in the U. S. One-million hp. was added last year. The largest power generating system, Tennessee Valley Authority, has an output of 14.25-billion kw.-hr. in 1948.

Canadian hydroelectric development continues to expand with a new high of 10,870,000 hp. installed in their waterways.—Power, Sept, p81



CONVEYOR DIVERGER

Packages of same width having one flat riding surface are automatically diverted into two other lines in any desired proportion by this unit. Called the Auto-Diverger, unit may be used with either belt or live-roller horizontal conveyor. Photoelectric cells keep lines filled to required capacity. It is a Standard Conveyor Co. development.—Factory, Sept, p148

Nitrogen Protects Foods From Process to Consumer

Deterioration of foods from oxidation may be prevented in many instances with proper use of nitrogen in packaging and processing. In some cases, a nitrogen blanket protects the foods during the processing and until they are consumed.

Liquid foods may be purged of oxygen with nitrogen, carbon dioxide, or steam. Nitrogen has been found to be most economical. In purging, the liquid is completely saturated with nitrogen under pressure. A nitrogen blanket may be simultaneously used. Care however must be exerted in packing the product to assure complete absence of oxygen; otherwise, the purging is useless.

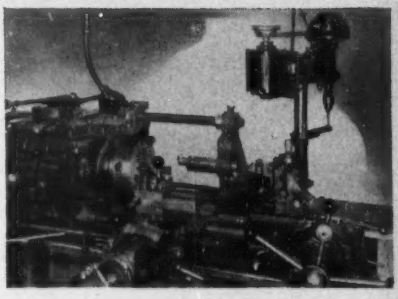
Another application of nitrogen is to break the vacuum in cans. In these instances the air has been removed, but to prevent collapsing of the cans, nitrogen is used. A similar situation occurs in head spaces of bottles. There, in addition to purging, the nitrogen creates a partial vacuum.

Many other applications of nitrogen in the food field are being discovered. In fact, almost any situation where oxygen is not desired can make good use of nitrogen.—Food Ind, Sept, p37

Infra-red Drys Tungsten

Infrared heat lamps have been found effective and comparatively inexpensive in drying gravity and flotation concentrates. These lamps reduce moisture content to less than 0.02% at less than $1.85 per ton. Previously it cost $3.00 per ton on an open hearth.

At Tungsten Mining Corp., the aim is to dry completely without roasting any of the contained sulphides. This is accomplished by mixing and turning the concentrates by screw conveyors. Altogether, three or four tons of high-grade tungsten concentrate are treated daily.—Eng & Min J, Sept, p82



LATHE-MOUNTED DRILLPRESS

Woolery Machine Co. has a light drillpress mounted on a turret lathe to drill an oil hole in bronze bushing being machined. Arm extension from press column to drill supports a hardened bushing. Drillpress on lathe saves second operation and handling time.—Am Mach, Aug 25, p82

"Do It Right" Campaign

A jingle campaign at RCA Victor Division has cut handling costs and increased employee interest in careful materials handling. "Do It Right" was the theme of the campaign which ran for 6 months under the auspices of the engineering products department.

Some 600 of the department's 5,000 employees entered the contest. Jingles were judged, and each one that was worthy was broadcast over the plant's public address system. The writers of jingles that were broadcast received $1 each. About 35% of the suggestions proved valuable.—Factory, Sept, p104

Russian Oil Production

Recently disclosed figures show Russian oil output is up 12% over last year. (World production, exclusive of the U. S., Russia, and Eastern Europe, was up 15.9%—see McG-H Digest, Oct, p26.)

Russian Council of Ministers also claims 1949 crude-oil production to be slightly more than double that of 1945. —Oil & Gas J, Aug 25, p89

Textile Training Program Held on Cooperative Basis

Joint training program carried on by mills and Lowell Technical Institute enables students to get actual industrial experience. Four students, two chosen from the chemistry course and two from the cotton, general manufacturing, or engineering courses, are assigned to a three year summer training program.

The first-year schedule gives the students an overall picture of the industry. The amount of time spent in each department is as follows: one day in personnel, acquiring knowledge of company organization; 1½ days in the opening room; 5½ days in carding; 2 days in spinning; 3 days in warp preparation; 4 days in weaving; 1½ days in cloth rooms; 5 weeks in converting division; 4 days in maintenance and repair; 1 day in chemical lab.; 1 day in physical lab.; 2 days in production control; 2 days in accounting; 2 days in personnel methods; 1 day in design; 1 day in drafting; and 1 day in purchasing.

During the following 2 years the student pursues a program more closely connected with his field of study.—Textile World, Sept, p103

Reduces Petroleum Residues

Two problems face the petroleum-refining industry in disposing of heavy residues by coking: (1) cheap removal of coke from the ovens and (2) disposal of the coke product which cannot be marketed in sized grades without excessive degradation.

Curran Carbonizing & Engrg. Co. has developed a method that may solve both these problems. The coke is removed by a pusher ram without use of manual labor.

The process is designed to operate on cracked residuum heavy topped fuel oil or heavy asphaltic grades. Oil is fed to a fractionating column, from which bottoms are passed through a heater and an evaporator.

Heavy residue from the evaporator is pumped to the ovens in which it is converted to coke, recycle material, and gas. To remove the coke from the refractory floor, doors at both ends are raised. A motor-driven ram pushes the coke into a conveyor which delivers it to the quenching station.—Oil & Gas J, Aug 18, p100

Carbon-Black S-Polymer Bag Put Unopened into Mixer

Godfrey L. Cabot, Inc., is putting carbon black into Banbury mixers in S-polymer miscible bags. The heat-sealed, transparent bags dissolve in the mixing operation, and tests prove it to be completely compatible with most types of rubber mixtures. It in no way affects the physical properties of the rubber.

By putting the bag into the mixer unopened, every ounce of carbon black is utilized. Cleanliness is assured within the plant; contamination of other products in the plant from carbon black in the atmosphere is eliminated. Previously disposal of carbon black shipping bags was a problem as they could not be disposed of as waste because of the residual carbon black clinging to bagging.

The transparent bags are covered with a black multiwalled Kraft paper outer bag for protection during shipment.—Mod Packaging, Aug, p81

Eases Pamphlet Gathering

Multipage literature from Allis-Chalmers Mfg. Co. advertising and industrial press section is assembled from a rotating gathering table rotated by a fractional-hp. motor. Speed of rotation is controlled by a foot-switch. The 85-in. dia. table accommodates 23 stacks of 8½ x 11-in. sheets on its periphery. Assembly of literature is most efficient with only two or four girls picking up.—Factory, Aug, p132

Report to Management

New Construction Methods Improve Structures, Cut Costs

- Cost and Concepts of Water from Waste
- Codes Restrict Use of Thinner Walls
- Long, Economical Hollow Box Girders
- Better Dams Depend on Good Concrete
- Aluminum Permits Improved Bridges
- New Suspension Bridge to be Safer
- Prestressing Improves Concrete
- Profit from Engineered Earthmoving
- Light-Gage Steel Changes Building
- Laminated Timbers Cheap, Efficient

This survey of current building methods and a look at possible future construction principles is taken from Engineering News-Record. Reprints of the original are available for $3.

Cost and Concepts of Water from Waste

THE THOUGHT of reusing water that has been reclaimed from sewage systems is repugnant. Yet, daily, thousands of people drink treated water that previously was polluted by municipal sewage and industrial wastes. The rising demand for water and the accompanying rise in costs for developing distant water-supply projects make reuse of water more and more important.

Solely on esthetic grounds, public prejudice prevents direct reuse of reclaimed water for domestic purposes even though the reclaimed water complies with all standards for potable water.

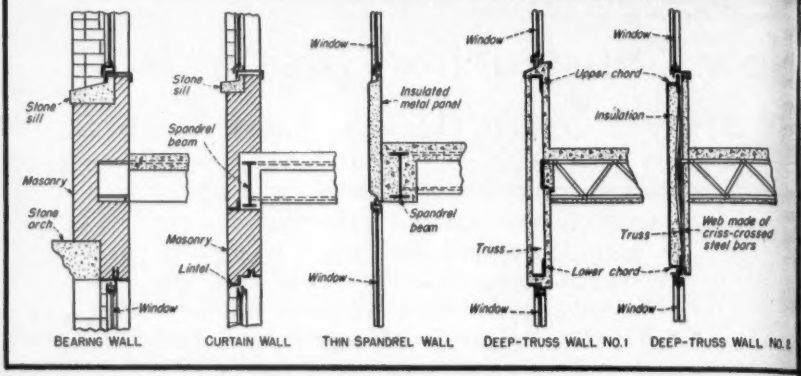
Two essentials for unrestricted use of reclaimed water may be recognized:

- Reused water must undergo some "natural" form of purification.
- Also it must be blended either before or after purification.

If reclaimed water is to be used unrestricted, certain rules must be followed: Plant must be separated completely from sewerage facilities serving the area. Sewage disposal facilities should be capable of handling the entire flow of the water-reclamation plant. The plant should be located so sewage supply is of a chemical composition that will permit production of satisfactory water.

The only practical method of returning effluent to ground-storage areas is by spreading the effluent on natural sand beds by fill-and-draw system. This costs about $2 per million gallons.

Efficiency tests of natural sand beds show that well-oxidized effluent applied to spreading area at the rate of 0.5 cfs. per wetted acre during a 14-day period showed no pollution or aerobic condition 4 to 7 ft. below the ground surface.



***SKELETON-FRAME** construction permits use of lighter walls but . . .*

Codes Restrict Use of Thinner Walls

MAJOR STUMBLING BLOCK to thinner, lighter wall is current building codes, long out of date. In most U. S. cities, walls of multi-story office and apartment buildings of masonry construction must be at least 8 in. thick. Walls have been designed that give the same performance yet weigh only 5 or 10% as much as the 8-in. masonry walls.

The concept of thin, lightweight curtain walls is almost as old as skeleton frames. Three trends are discernible:

- Adaption to urban structures of metal-pan construction, as used in industrial buildings, is tending to replace masonry walls entirely.
- Modification of traditional masonry walls by using a metal or clay-product face panel. These curtain walls are carried by the floor system.
- Use of deep-truss wall carrying the floor system and transferring the load directly to the columns.

Most of the steel panel systems used in industrial buildings could be adapted for use in "fireproof" multi-story structures were it not for the fact that in test the panel side away from the fire would average 250°F. in less than the required 2 hr.

Some metal-pan systems are being modified to meet the 2-hr. requirement. But in modification they lose much of their simplicity. Also, unless the panel is thickened, it is necessary to reduce the over-all insulation value and to use core materials containing water.

Appearance of many industrial panels now in use can be improved but some are quite satisfactory. Durability of the panels is good. Panels of carbon steel should be protected with porcelain enamel. Stainless steel may replace carbon steel to upgrade quality of panels. Aluminum, because of its low melting point, does not pass fire requirements. The back-up material must stand the total wind load and pass fire test.

Where codes have been modified, ways have been developed to enable 2 to 4 in. of lightweight masonry to withstand lateral wind-load test. One such method is a flat strap-iron reinforcing placed in joints between adjoining 16-in. lightweight concrete blocks. Another is waterproofing and reinforcing of a 3-in. lightweight pumice-concrete block wall by bonding stainless-steel spandrel face to the masonry backup.

Long, Economical Hollow Box Girders

WORK WITH CONCRETE is always limited by the "150 lb. per cu. ft." weight of the material. The problem of longer, more economical girders for bridge design seems partially solved by the use of beam sections in the form of hollow boxes.

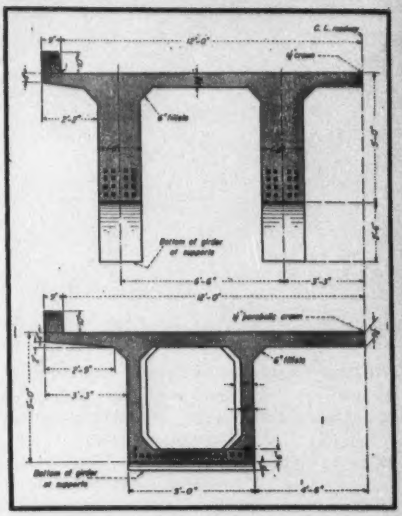
Hollow box girders or beams may be either single- or multi-celled and can be used on spans of 50 to 250 ft. Made up of slab-and-wall sections 5 to 6 in. or more thick, they are thoroughly integrated by interior transverse diaphragms. Their structural advantages:

- Minimum section and maximum weight in midspan zone where each pound has greater leverage about the supports than elsewhere.
- Room for widespread, uncrowded distribution of tension steel, assuring maximum lever arm of resisting couple.
- Ample compression flange width at supports of continuous beams and rigid frames.
- Ready adaptability to changes of web and flange thickness.
- Very great torsional strength in single-walled form; much greater than afforded by single-webbed beams connected by occasional diaphrams.
- In multi-celled form, because of complete integration achieved, probably the greatest longitudinal and transverse strengths that normally can be developed in any bridge deck of beams and girders.

Add to these the architectural advantage that box sections possess as a result of size and scale commensurate with span. Also add the inherent economies of box sections.

A basic consideration in girders is the stiffness and rigidity that is inherent in a hollow section. Relative position of webs and flanges is fixed by interior diaphragms that are integral with them and are spaced at equal intervals. To deform it or to shorten one diagonal and elongate another is difficult.

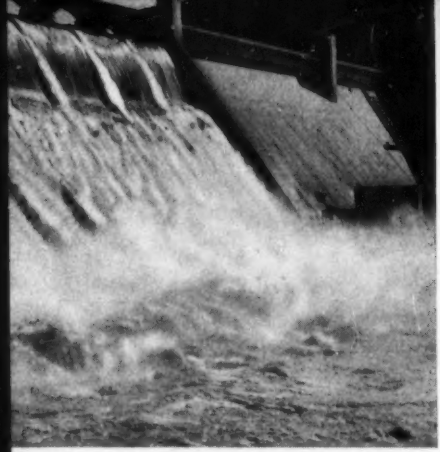
As with other types of structures, box-girder spans need cambering. An allowance of $\frac{1}{8}$ in. for each 10 ft. of interior span and $\frac{1}{16}$ in. for each 10 ft. of end span will not depart far from the desired grade line in normal, constant-depth sections.



ROADWAY and depth at midspan are the same, but depth of T's increase 50% at supports. Box is more economical.

Cantilevers are advantageous in reducing the size and cost of abutments. They are sensitive to temperature changes in roadway slab or in the next span and will swing through an arc of $\frac{1}{2}$ in. or more, depending upon condition. A short transition slab span used between the cantilever end and point of unchanging elevation will avoid unlevel roadway slab.

Form work required for box girders is simple. The required 45° and 90° angles are easy to form. Changes in thickness of girder web can be made simply by gradual tampering of forms or by small, abrupt offsets.



Better Dams Depend on Good Concrete

BETTER DAMS can be built by making better use of the available technical knowledge and making the best adaption practical of present concrete or by developing a new concrete.

The type of concrete needed for low-cost dam construction is one that has low thermal-volume change, a high degree of plasticity and extensibility, a high degree of impermeability, and sufficient strength to carry the loads without increase of section dimensions. But we do not know how to make this kind of concrete so we must depend upon better and cheaper ways of adapting concrete as we now know it.

Temperature rise and thermal shrinkage of concrete in dams give rise to mass concrete problems because the heat generated during hydration must be dissipated. Volume shrinks as temperature is reduced. This shrinkage must be carefully controlled to avoid serious cracking.

Certain expedients have been devised to control volume change: low-heat cement, pozzolans, sand cement, air-entraining agents, rich-face cement.

The development about 1930 of "low-heat," or Type IV, portland cement was important to dam builders. It is produced by reducing the tricalcium aluminate and tricalcium silicate compounds and increasing dicalcium silicate content.

Low-heat cement is beneficial only in combination with artificial cooling or long periods of exposure between lifts. Without artificial cooling, it is better to use Type II cement which has a more rapid rate of early heat generation and dissipation. Both Types II and IV cements improve extensibility through reduced tricalcium aluminate content.

Cements for mass concrete projects should be ground to 1,600 to 1,800 specific surface to reduce bleeding, improve workability and uniformity, and insure adequate early strength for form removal.

Portland cement interground with pozzolanic materials have been used in many U. S. dam projects. Pozzolans include calcined shale, calcined clay, blast-furnace slag, and volcanic tufa.

Pozzolans included with Type II cement improve construction as follows: reduce dissolution, temperature rise, drying shrinkage, thermal shrinkage, and water content; develop early strength slowly but high ultimate strengths; increase watertightness, plasticity, and resistance to sulphate attack; and improve extensibility and workability of the concrete.

Air entrainment—entrainment of tiny air bubbles within the concrete—has been a major boon to dam construction. It improves workability, handling, and finishing; reduces cost, unit weight of concrete, temperature rise, and thermal shrinkage with no reduction in watertightness. There is about 5% loss in strength for each percent of air added.

It is known that certain aggregates react with alkalies in cement to cause expansion of the concrete. If they are used, ameliorating steps—low-alkali cement, pozzolans, air entrainment—must be taken.

Aluminum Permits Improved Bridges

ALUMINUM OPENS new possibilities for longer spans in new bridge design or economies in reconstruction of old bridges. It offers one important advantage over carbon steel and silicon steel—greatly lower weight for equal strength. But this advantage must be balanced against the higher cost of aluminum.

Present pound-price ratio between silicon steel and 14S-T6 aluminum is 3.6. Since the weight-ratio of the two is 2.8, the relative cost of structural aluminum *per sq. in. of cross section* is 1.29 compared to silicon steel. With basic unit tensile strength stresses of 18,000, 22,000, and 24,000 for carbon steel, aluminum, and silicon steel, the relative cost of structural aluminum *for equal tensile design strength* is 1.41 compared with silicon steel, 1.19 with carbon steel.

High-strength aluminum alloy now available for bridge construction are: plates—Alclad 14S-T6 and R301-T6; structural shapes—14S-T6; pressure-driven rivets (cold)—A17S-T6; hammer-driven rivets (hot)—53S-T41.

Aluminum structures cannot be designed using steel data and only changing unit stresses. New and independent reappraisal of all accepted conventional limitations is required.

Economy of Material—Pound price of aluminum outweighs cost of fabrication and erection. Emphasis must be on saving weight rather than saving fabrication. Trussed floorbeams may replace solid-web floorbeams. Continuity of main and floor members and stress participation by floor and bracing members should be utilized.

Weight Saving—For small bridges, aluminum will save 50–60% in weight. In 600-ft. spans, savings would be 65–70%. In the longest spans, savings up to 80% are possible. A saving of 72% is necessary to equal first costs. Where compression is the principle stress, steel may be preferable. Suspended floors and spans, arch decks, and similar parts offer most saving through use of aluminum.

Relative Labor Costs—As wage rates rise, initial material costs are minimized. Change favors aluminum construction.

Lower Modulus—Lower modulus of elasticity (10,300,000 as compared to 29,000,000 for steel) needs to be considered. For compression members, the lower modulus of elasticity yields an increased reduction factor for slenderness ratio.

Use of Extruded Shapes—Availability of extruded shapes make more flexible the design of one-piece chord or column sections. Extrusion sizes are limited to those designs that can pass through a 17-in. circle. Special extruded shapes are justified where large numbers of pieces make die costs secondary.

Wind Resistance—Lightness of the material requires greater resistance to wind uplift and overturning in bridge shoes and end details than in steel.

Fabrication—Less power and lighter tool are required for aluminum work. Field riveting should be minimized. Plates and shapes not thicker than ½ in. can be cut by sheers. Mistakes in fabrication are more costly than in steel work.

New Suspension Bridges To Be Safer

FUTURE SUSPENSION BRIDGES will not be threatened by aerodynamic instability. Since the crash of the Tacoma (Washington) Narrows Bridge several years ago, the Advisory Board on the Investigation of Suspension Bridges has studied long-span suspensions. Their findings will make the four long-span suspension bridges now under construction in the U. S. and those to follow completely safe.

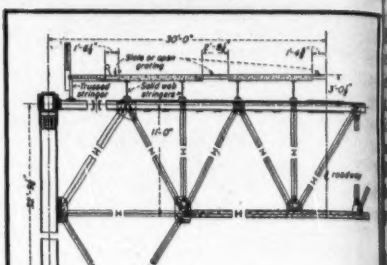
Weight alone has a steadying influence on oscillation but is expensive. Proportions of side span to main span lengths, sag ratio of cable, depth of stiffening trusses, width between trusses, all have an effect on stability against torsion and vertical oscillations. Structural features, such as lateral braces to absorb energy otherwise reflected in adverse oscillation and vibration, are basic parts of good suspension-bridge design.

Design for the new Tacoma bridge (above right) provides about 50% increase in dead load of the suspended structure over its predecessor. Added weight is due to greater width, which adds to stability. Trusses substitute for plate girders, increasing vertical elastic stiffness. Horizontal and vertical oscillation can be reduced by: (1) deck being nearer the horizontal plane of the top chords of stiffening trusses and (2) a lateral system used in the plane of the bottom chords.

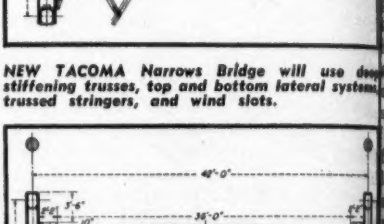
Air slots in decking will contribute a small amount to behavior of a bridge to resist torsional and vertical movement, although slots in the plane of the roadway adjacent to stiffening trusses will reduce harmful vortex-shedding effect of truss chords.

The Board's studies are to be published in book form covering the following information:

- A hypothesis explaining excitation of oscillation in suspension bridges.
- An analysis of free vibration, and an "exact" method, involving the solution of fourth order differential equation of forces during vibration.
- A definition of condition determining the "steady-state" amplitude, and a choice of measures for reducing it.
- Energy method for bridges with continuous stiffening trusses.
- An explanation of the character influence and mathematical treatment of "damping capacity."
- A plot of movement and deflections calculated by the linearized theory for 15 live-load conditions.



NEW TACOMA Narrows Bridge will use deep stiffening trusses, top and bottom lateral systems, trussed stringers, and wind slots.



A NEW YORK suspension bridge will utilize 23-ft. deep stiffening trusses.

Prestressing Improves Concrete Uses

PRESTRESSING CONCRETE makes possible remarkable advancement in structural engineering. Five flat-arch bridges over the Marne River have a depth of only 37 in. for a span 243 ft. long. A Chicago warehouse has a 14,000-sq. ft. floor only 7 in. thick which, though subjected to heavy loads, shows no cracking after 3 years of use.

The secret lies in applying forces to the concrete to overcome tensile stresses caused by loads, volume changes, and impact. This creates a concrete capable of taking tension without cracking, makes it efficient as a building material. Prestressing makes it possible to put to full use the best concrete and the highest-strength steels.

Steel with high tensile strength is used for the prestressing. This permits a large prestress to be applied with a small amount of steel, and the stress loss in the steel through plastic flow and concrete shrinkage is proportionally smaller as the applied tension is increased.

Prestressing converts concrete into an elastic material—one for which the deformations can be computed.

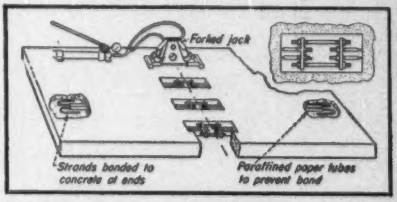
Cold-drawn steel wire is preferable for prestressing; the wires can be either free within concrete or bonded to it. With bonding, wire is tensioned against anchors, then embedded in concrete; after hardening, wires are released.

Where wire is not bonded to the concrete, it is placed in ducts or pipes and tensioned against hardened beams.

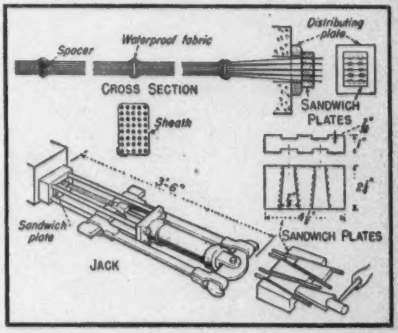
Wire should be high-strength. With initial stress of 150,000 psi., wire can take losses of 20,000 to 30,000 psi. without altering character of the structure. Volume of concrete must be kept to a minimum to avoid excessive dead weight.

In slabs or beams where wires are curved (top picture), wire is passed through pipes or paraffined paper tubes to prevent bonding. For long spans, wires extend the length of the hollow in the form of a parabola and are anchored over supports.

Cables follow a parabola in hollow beams.



Forked jacks at center tension wires.



Jack tensions two wires at time.

Anchoring of wires at ends can be by bond and tensioned by forked jacks at center (center picture). Jacks tension opposing pairs of wires.

Some designers advocate stressing only two wires at a time,—more than that does not give equal tension. Jack (bottom picture) has a 10-ton capacity. Wires are anchored to a cast-steel "sandwich," which acts against a plate.

Profit from Engineered Earthmoving

STUDY OF PERFORMANCE and costs of equipment in earth-moving jobs is important if the moving is to be done economically and efficiently. Known basic principles of earth-moving equipment make it possible to evaluate one type of equipment against another type for a given job. Such comparison will increase output and lower costs.

Well-planned, or designed, equipment should:

- Reduce investments to a minimum.
- Produce the greatest unit performance.
- Reduce unit costs below similar or competitive methods or machinery.
- Indicate a good economic position during a potential life.

There is a long list of factors affecting earth-moving equipment performance. The number can be reduced and rule-of-thumb figures are sufficient to assure suitable accurate figures.

Factors most important in figuring performance and cost are: machine weight, empty and loaded; materials weight; power, in terms of accomplishment; grades, adverse or favorable; rolling resistance; coefficient of traction; speeds and differential speed options; acceleration and deceleration; tires; gear ratios; altitudes; mechanical factors—grease, fuel, repairs, labor; efficiencies, human and mechanical.

Each design factor has its own peculiar effect upon final performance and cost. Each must be understood before evaluation can be made.

Weights—An accurate knowledge of weights affect speeds of travel, acceleration, quantities delivered. All these affect costs. When light loads are encountered, a given amount of power can do more work either in larger loads or at higher speeds.

Materials—Unit weights of materials, either solid or loosened, make up gross loads. Swell and compaction characteristics affect the load carried. Thus materials that bulk excessively produce less "pay loads" in a carrier than one that does not.

Horsepower—This is hard to estimate since power is stated in several different ways. With track-type machines, power is usually stated as drawbar pounds. Over adverse grades, weight of tractor absorbs a portion of its own power.

Automotive work is even more confused in the ways in which power is stated. Since there is no common ground, inquiries must be made to obtain figures on which to make performance calculations.

If a 200 brake or flywheel horsepower engine were compared to others rated at 200 hp., their work-power calculations would run: Rimpull hp.—200 hp. or 100% at tires; brake hp.—176 hp. or 88% at tires; bare, continuous—158 hp. or 79% at tires; bare, intermittent—130 hp. or 65% at tires.

Grades—Adverse grades use about 20 lb. of engine rimpull or drawbar per gross ton of weight of machine per 1% of grade. Favorable grades add the same to efficiencies.

Rolling Resistance—Rolling resistance is given too little consideration in figuring efficiencies. It is not a condition of the ground surface alone. It is a combination of tires, pressures, and ground surface.

Coefficient of Friction—Track grousers and rubber each have definite traction on different surfaces. In good footing, grousers deliver about 90% of their weight; rubber about 55%.

Speeds, Speed Options—Possibility of speeds is based on gross and empty weights, power, grades, and rolling resistance.

Acceleration, Deceleration — These time-consuming factors must be considered on any long-haul operation. Starting points should be arranged to give

maximum benefit to the equipment. Start downhill if possible. Excessive weight, limited power, high rolling resistance, and starting on adverse grades effect time cycles.

Tires—Favorable use of tires greatly affects performance. Soft spongy ground can, in part, be overcome with larger tires and air pressures as near the bearing value of the ground as possible.

Gear Ratios—Most hauling equipment has optional gear-ratio groups that may be bought in the original package. Optional gear ratios, too, are available for changeover.

Altitudes—Power decreases with increase in altitude. A good rule-of-thumb for figuring decrease in horsepower in four-cycle engines is 3% loss per 1,000 ft. above 1,000-ft. elevation.

Light-Gage Steel Changes Building

LIGHT, COLD-FORMED STEEL panels for walls, ceilings, floors, and roofs of industrial buildings are becoming popular in the United States. Within limitations, steel with ¼-in. thickness or less will exert an increasing influence on future construction design.

Skyscrapers of the future will follow probably the current designs but innovations will result from use of light-gage steel. The most outstanding development probably will be in the application of shallow, lightweight panels to second-floor construction and exterior walls to lessen support frame weight.

Two-story houses and commercial buildings may have walls framed with light-gage studs, the sides being assembled on jigs and put in place as one piece. Walls may consist of steel panels, each several feet wide and one or two stories high.

These are but possibilities. But such construction will reduce erection time and cost, and make obsolete the erection of small buildings by hand methods. Large-unit fabrication is already a reality.

Design specifications by the American Iron and Steel Institute for light-gage steel construction establish safe load-carrying capacities and deflections of beams, panels, and columns both stiffened and unstiffened.

While basic design principles for light steel members are no different from those applicable to conventional hot-rolled shapes, certain supplementary considerations enter into the design of light sections, particularly where they include wide, thin compression elements.

To limit fields of application for light-gage steel floor members, it must be pointed out that standard steel shapes must be used where the loads to be supported require the full structural properties that the heavier members possess. But in residential, business, school, and institutional structures, live loads do not require the standard steel members.

Light-gage steel flooring and open-web steel-joist flooring are practical for spans with live loads up to 125 psi. In such jobs, the flooring dead load is lower than that of conventional framing. This fact becomes more and more important as the height of the building increases.

STAINLESS STEEL walls were used for General Electric's 400-ft. long, four-story office building.

Laminated Timbers Cheap, Efficient

TIMBERS FOR CONSTRUCTION are being "grown" in shops today in sizes and of strength greater than nature can grow them. Laminated timbers are being used as members for dredge spuds, curved and straight truss chords, two and three hinged arches, tied-arch ribs, girders, columns, and dome rings.

Single timbers 36 in. sq. and up to 115 ft. long have been produced. Glued laminated bowstring trusses have been built up to 232 ft. long; timber arches up to 200 ft. long.

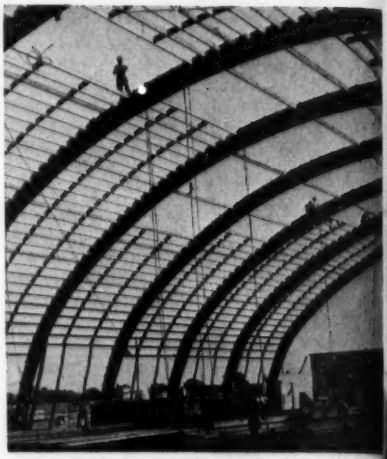
Structural members are now detailed and fabricated like steel members. It is now possible to build with timbers without the limitations of size, length, checks, and splits. Glued laminated (glulam) timbers have many advantages and no disadvantages, except perhaps cost. Size and shape are limited only by handling facilities. They can be shaped for tapered sections; may be curved without band sawing, steaming, or pickling. They are pre-seasoned and do not check, or warp. And glulams are stronger and stiffer than sawn timbers.

Most research on glulams is being conducted by the U. S. Forest Products Laboratory. It will soon announce strength and design findings for glulams.

The proved basic stress values of dry, clear wood are given and, because of increased strength for dryness, are found to be higher than those of sawn timber. Percentage-wise increases are: bending or tension with grain, 25%; shear, 14%; compression across grain, 15%; compression with grain, 40%; modulus of elasticity, 13%.

Lumber for lamination should be seasoned to a moisture content that approximates service conditions—but not less than 7% and not more than 16%. Surfaces should be machine-finished, but not sanded, to a smooth finish with less than $\frac{1}{64}$-in. variation.

For curved members, timber must be curved dry without injury. Thus, the greater the curvature the thinner the laminations must be. And the higher will be the final costs. It is therefore important that designers keep minimum radius to as large a figure as clearance permits.



GLUE-LAMINATED TIMBER arches of this California building are 130-ft. spans.

Laminations may be of one, two, or more pieces placed side by side the full width. For exterior timbers, laminations should be either one-piece or the outer ones edge-glued. Pressure during gluing operation should be at least 75 psi. Nails or mechanical clamps should not be used because of uneven pressures and slippage.

Glulams are of two types—interior and exterior. Where moisture content will not exceed 20%, interior timbers may be made with water-resistant glues such as urea or casein.

For exterior timbers, where moisture content may exceed 20%, waterproof glues—phenolics—must be used.

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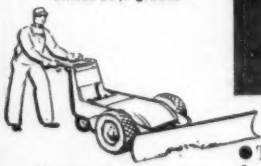
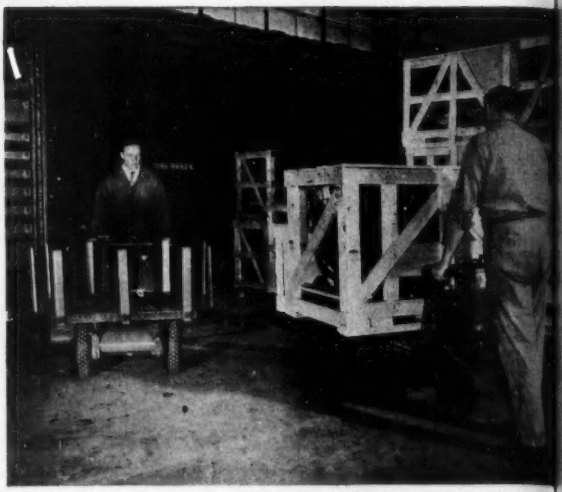


Light grader and scraper



Crated Prime Movers being loaded for Marshall Plan shipment at Bell factory.

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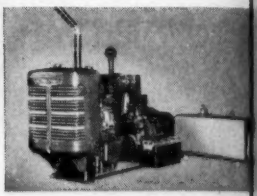

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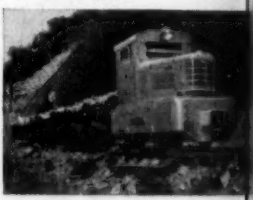

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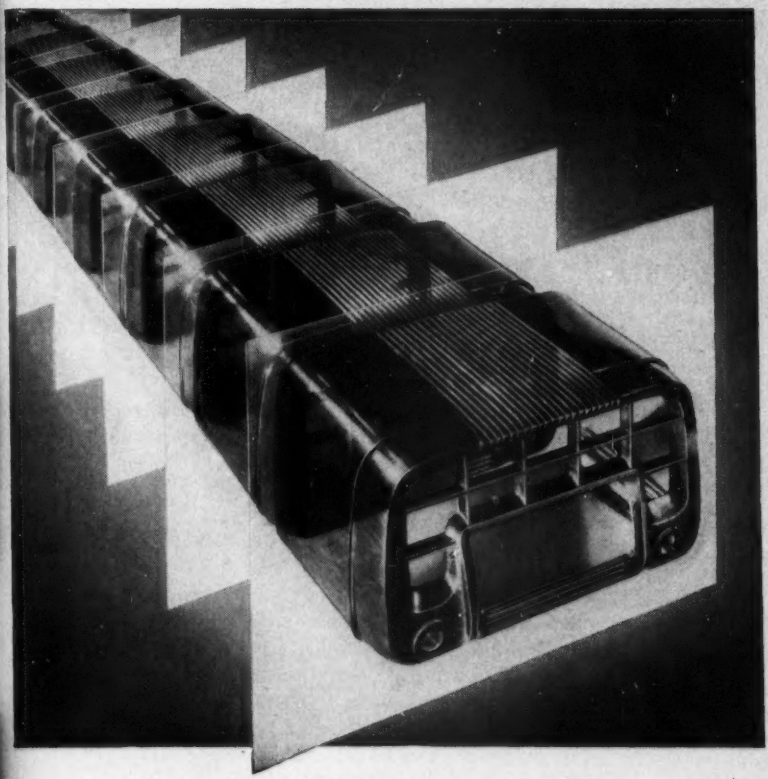

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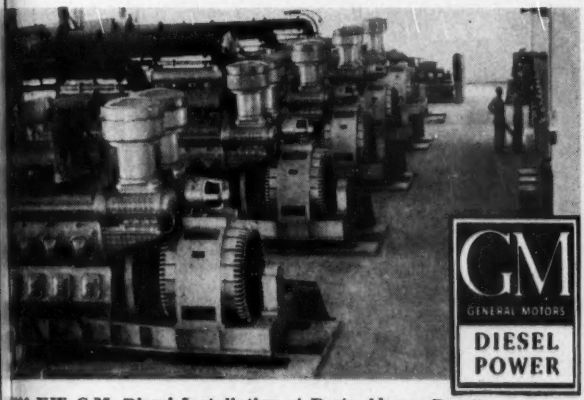

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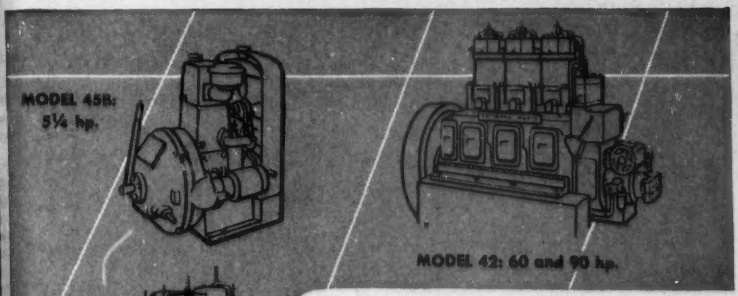

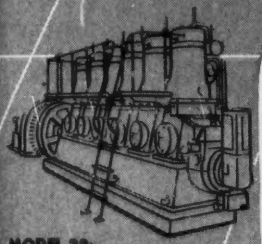

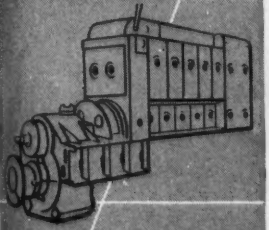

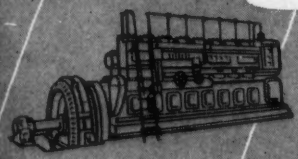

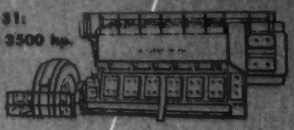

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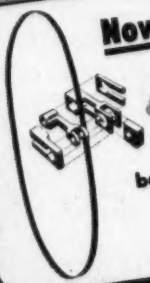

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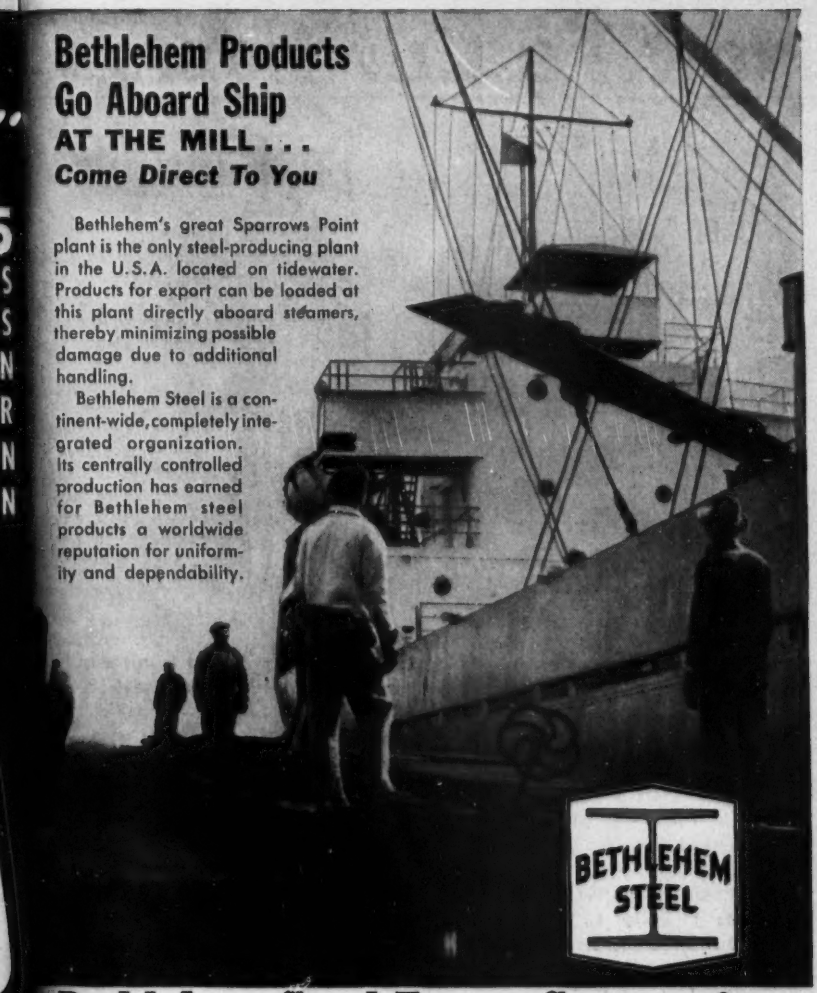

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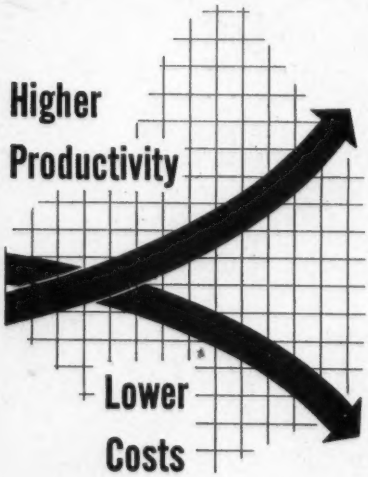

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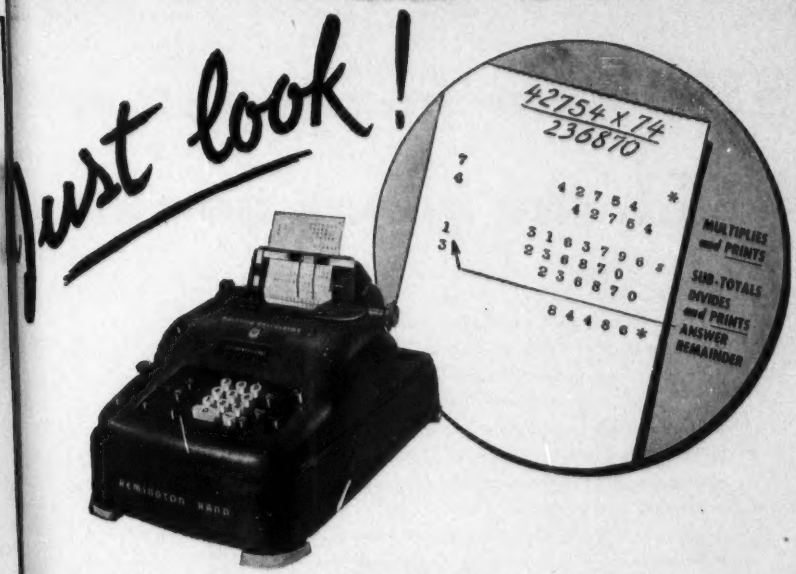

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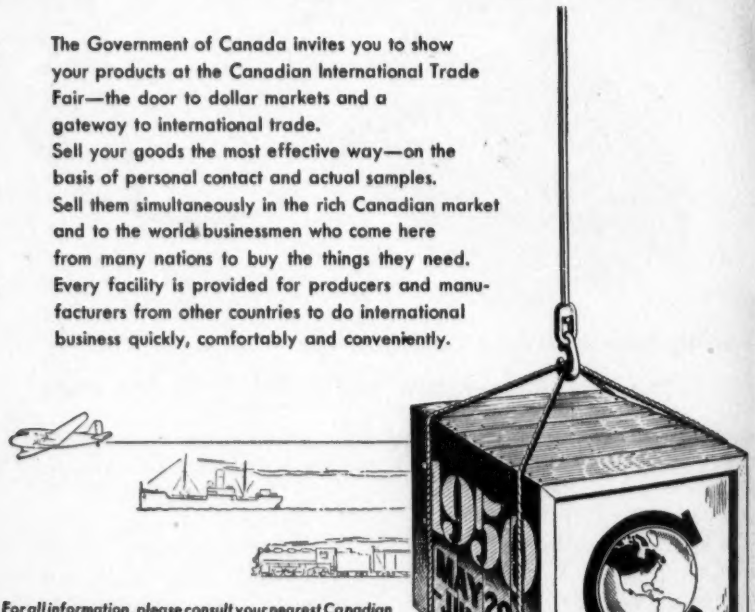

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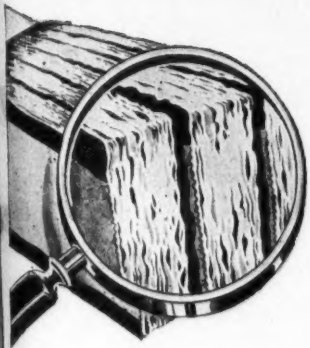

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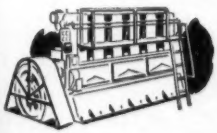

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